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Deus in excelsis

et in terra pax



DISCOURSES  
ON THE  
NATURE AND CURE  
OF  
WOUNDS.

IN TWO VOLUMES.

~~~~~  
BY JOHN BELL, SURGEON.  
~~~~~

FIRST AMERICAN EDITION.

—♦—  
VOL. I.

OF WOUNDS IN GENERAL.

OF PROCURING ADHESION.  
OF WOUNDED ARTERIES.  
OF GUN-SHOT WOUNDS.

|| OF THE MEDICAL TREATMENT  
|| OF WOUNDS.  
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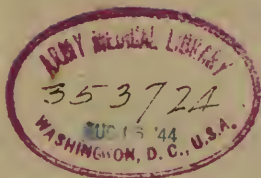
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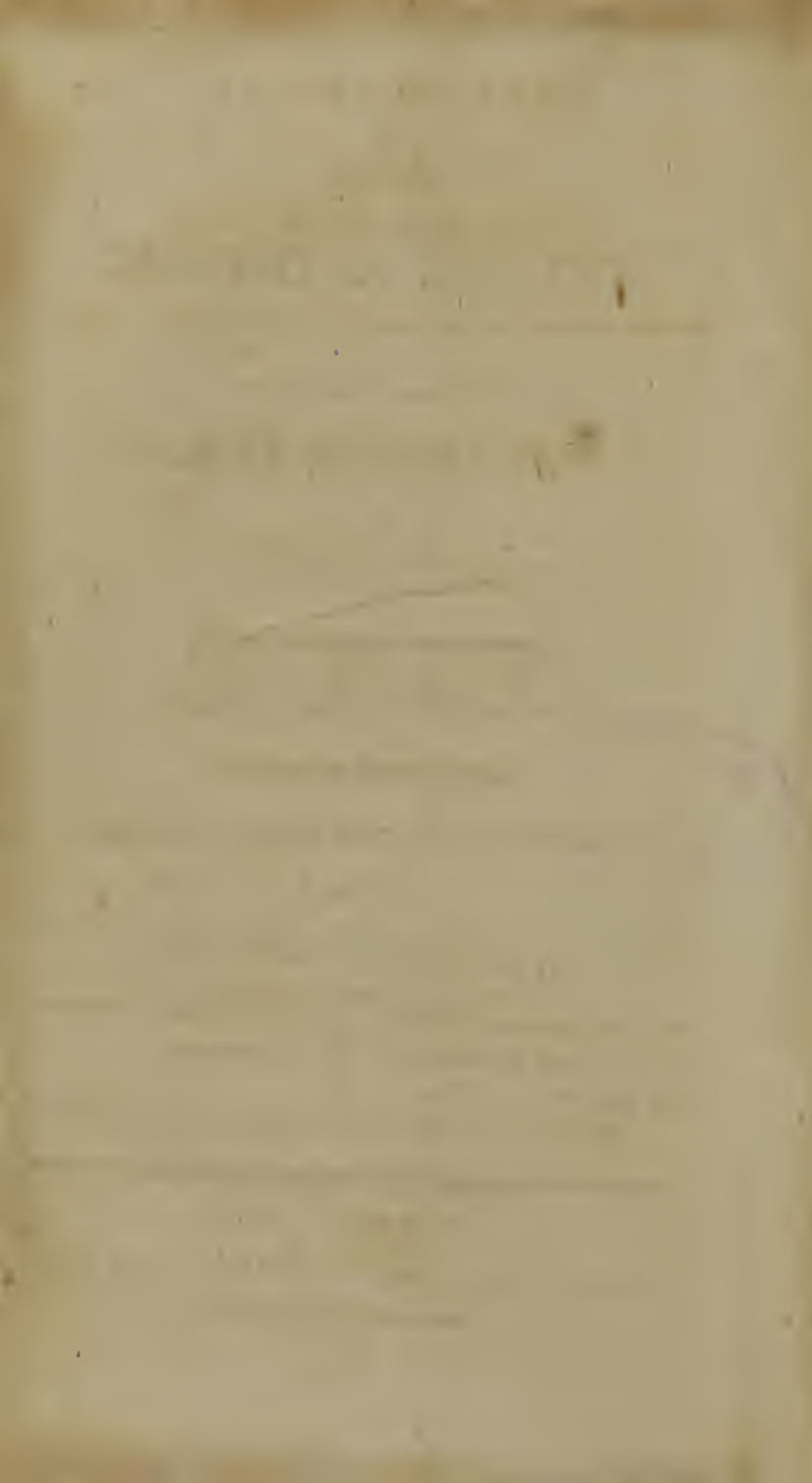
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1807.





TO  
ERASMUS DARWIN, M. D.

KNOWN TO THE AUTHOR ONLY BY HIS VALUABLE WORKS,

THIS BOOK IS PRESENTED,

AS AN HONEST AND INDEPENDENT TESTIMONY

OF

RESPECT AND GRATITUDE.

THOSE WHO, TO MEDICAL SKILL,

JOIN LIBERAL AND ELEGANT STUDIES,

ENNOBLE THEIR PROFESSION,

AND ARE ENTITLED TO FREQUENT MARKS OF PUBLIC ESTEEM.

THE

AUTHOR OF THESE DISCOURSES,

INSTEAD OF COURTING PATRONAGE,

THINKS HIMSELF MORE HONOURABLY EMPLOYED

IN THUS ACKNOWLEDGING

HIS SHARE OF

THE COMMON DEBT.

## ADVERTISEMENT.

IT is becoming in an Author to give some reason to the Public why a book with so many faults is so little improved.

These discourses on Wounds are too imperfect to be much altered, too good to be entirely thrown away.—The Plan was limited at the first, and the work must remain in its original form ; for, without changing its character, it can hardly be improved.

Nothing more was designed than a sketch of a great and interesting subject ; but that sketch has been favourably received ; it has been found useful ; an Edition of Sixteen Hundred Copies has been rapidly sold ; and the approbation of the Public forbids the Author saying much concerning those imperfections which an Author must feel more sensibly than others, which, if he have a due respect for himself, he will be proud to acknowledge.

It is some time since these discourses were composed : The Author was, even at the first, conscious of many imperfections, and is sensible that he now regards them with such impartial and chastened approbation as a friend might indulge : The natural progress of the mind, when continually employed in the pursuit of knowledge, inclines every man of sense and diligence to think, perhaps, too humbly of past labours. The Author of this Elementary Book has been at pains to correct some of the many errors of the First Edition, and should be happy to make this more worthy of the approbation of the Public, or of those Gentlemen to whom it is inscribed.

But while he is employed in another work, in which the general principles of Surgery are more fully displayed, he shall feel himself greatly supported if the Public condescend to receive, with any degree of favour, this Second Edition of the Book on Wounds.

*Edinburgh, 1800.*

# P R E F A C E

TO THE  
FIRST EDITION.

THE Author of these Discourses will not allow himself the benefit of that apology, to which he is but too well entitled ; for the apology of want of time surely is not respectful towards the Public : it intimates, that with time the Author could have written a more orderly and a better Book ; an intimation which is always immodest, and often untrue. The Author knows but too well how often, in this Book, the marks of hurry will strike his Reader. He mentions his consciousness of this with regret ! He feels the necessity of requesting that indulgence which every author needs and claims.

The very plan and title of this Book is new ; and the Author has deviated from accustom'd forms in this instance, from no other motive than the hope of making these Lessons both pleasant and useful. This method of teaching by Discourses is as yet untried : it may have its advantages, it must have its faults ; and this increases that kind of anxiety which is inseparable from the act of appearing before the Public, and which even the sense of duty can hardly relieve.

The Author has endeavour'd to bring into one easy and comprehensive view, those lesser operations of Surgery, which are not found under that much abused title of a Complete System. He has endeavour'd to interest his Reader, in the manner of managing wounded Arteries, and in many of the lesser points of practice. He has attempted to refute some favourite doctrines, not wantonly, but boldly ; " not because they belong to this Doctor or that Professor," but because they seem'd to him totally inconsistent with true philosophy, and incompatible with sound Surgery, in as far as it is as yet founded upon a knowledge of the powers and principles of the human body. He has us'd all that freedom with great names which the cause of truth and science requires ! he has published boldly many criticisms which he would not have ventured to mention in his Lectures, or in private ; for there criticism is no longer criticism, but the foul report and private malice of it works like a secret poison, against which there is no preventative nor cure. He has criticised the opinions of those chiefly, who, being at the head of the profession, are of course the best able, and, to all appearance also, the most willing to defend themselves.

But the Author has never allowed any pursuit of this kind to break in upon the order or purpose of his Discourse, which he has endeavoured to keep clear of all encumbrances, and in a plain and easy form : He has endeavoured to order it so, that his Reader may have first a free and general notion of each subject in the body of the Discourse, and he has put down more express and accurate rules at the conclusion of each : He has introduced the lighter pieces of history, to give ease and life to the subject ; and to give it weight and firmness, he has added rules of practice. He has endeavoured to give comprehensive and general notions, of Wounds—of Wounded Arteries—of Bruised or Gunshot Wounds—and of Wounds of the Breast, Belly, Head, Throat, and limbs, and especially of the condition of Limbs wounded with dangerous complications, as of lacerated Arteries and bruised Bones.

He trusts, that his manner of explaining these subjects will be plain and easy to the young Surgeon, to whom alone he presumes to address himself ; and, having thus honestly told his motives and his highest expectations, he hopes to find every indulgence ; and may be permitted to say, with Lord Halifax, That he who is resolved to play the critic with this Book on stricter terms, “ must have a degree of generous irregularity in his reasoning, else he will not be a good thing of his kind.”



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# DISCOURSE I.

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## ON PROCURING ADHESION.

WHEN a modern surgeon allows himself to talk about the “mundifying, incarnating, and cicatrizing of wounds, or directs how to fill the wound up with good and sound flesh, and keep it to a fair and even level with the adjacent skin,” he but proclaims his own ignorance of the properties of the living body. Perhaps he talks this language idly, and in mere compliance with the usual forms of speaking ; but if he has seriously any such idea of the business and duties of a surgeon, there is much reason to fear, that his methods, far from incarnating and cicatrizing wounds, will rather interfere with the regular process of nature.

It is an old, but it is a becoming and modest thought, that in our profession, we are but as the ministers of nature : and indeed the surgeon, still more than the physician, achieves nothing by his own immediate power, but does all his services by observing and managing the properties of the living body ; where the living principle is so strong and active in every part that, by that energy alone, it regenerates any lost substance, or re-unites, in a more immediate way, the more simple wounds.

When we can prevail upon ourselves to renounce this parade of idle words, and to resign also our supreme office of assisting nature in “mundifying, incarnating, and cicatrizing wounds, of filling the wound with sound flesh, and of keeping it to the right level, so as to make an even and seemly scar,” we shall find our duties happily reduced within the narrowest bounds, viz. of saving the patient from immediate bleeding, and of laying the

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wounded parts so cleanly, so neatly, and so evenly in contact with each other that they may adhere. The rest we leave to nature.

I fear that, from my announcing a rule of conduct so simple as this is, you will suppose that I mean to speak only of the lighter, and more trivial wounds ; while I do really mean to include, under this general view, the greatest and the smallest wounds ; and to establish but one rule for all, from the amputation of a limb, or the extirpation of a tumor, to the most trivial cut of the cheek or hand.

What is amputation but a wound ? The greatest wound,—clean and fair,—made carefully by the hand of the surgeon,—disposed to heal in the easiest way ? And in this great wound, (which, a fortiori, includes the doctrine of every lesser wound,) what is there to attend to, but the procuring of adhesion, or the stopping of the flow of blood ? What were the defects of the old operations, but that the surgeon knew not how to procure this adhesion ? that he had no means by which he could stop the bleeding ? The hæmorrhagy was fatal to most of those who needed to suffer this operation ; and the few, who survived, lingered through all the miseries of a nine months cure, tedious and imperfect, with conical, ulcerated, and tender stumps.—What indeed is the chief perfection of modern surgery, or the excellency of our operations ? but that in bleedings from great vessels we trust nothing to compression, cauteries, or astringents, but tie our arteries firmly ; and that we talk no longer about mundifying, incarning, or cicatrizing of wounds ; that we never dress the cut surfaces as distinct wounds, but put the sides or lips in close contact, and keep them so. We boast nothing of our own powers, but trust all to nature, whose business it is, to make those surfaces adhere which will adhere, or to re-unite, by the slower process of suppuration and granulation, the parts among which there has been a loss of substance.

Of these two great points this, of the spontaneous adhesion of parts, is what I shall first explain. This doctrine of the adhesion



of cut surfaces, and the inosculation of arteries, was but lately understood ; and very slowly and unwillingly received. Indeed the tales, which were at first told of it, were such as might have discredited the whole ; for it happened with this most important discovery of adhesion, as with the no less certain and curious phenomenon of the regeneration of the humours of the eye, or as with the interesting experiment of the safe and easy transfusion of the blood, that the extravagance of its inventors ruined the invention, and took away all hopes of profiting by it. Burhius and Kirkringius pretended to be possessed of particular medicines by which they could restore the eye, after it had been burst or cut open : and Taylor, Woodhouse, and others, pretended to cure the blindness of old age, by extracting the muddy humours of the eye, and replacing them with fresh transparent humours, by which the sight became as clear and fine, as in the youngest person.\*

\* Kirkringius tells his story in the following lamentable terms : That the King of Denmark, who was as skilful in sciences as clear in governing his realms, one day when he was reading a curious book upon glass-making, written by Andreas Frisius, asked his physician, Burhius, who was standing by, whether this story that the author told in his preface could be true, about cutting the eye open, and letting out the humours, and restoring it again ? “ O ! ” says Burhius, “ That Theodorus Kirkringius, mentioned there so honourably, is one of the poorest of my scholars in this art.” Kirkringius in revenge tells the whole story ; how he had heard of Burhius being possessed of this art ; how he had wished to ask the secret ; and how he was ashamed to propose buying it with money from a gentleman like Burhius ; how he studied and laboured to find it out ; and how he succeeded without any obligation to this same Burhius. “ Hoc scio, et hic profiteor me nullo horum modorum oculos restituere ; restituere tamen alia prorsus ratione, aliisque a me solo inventis viis addo ; nec facere me distinctionem inter albos et nigros, sed quolibet oblato animali,” &c. “ It matters nothing to me whether the eyes be black, brown, or gray, bring me what animal you please, I shall cut the eyes open, squeeze out all the humors, give him back to you as blind as a mole, and yet restore his eyesight in a very little while : I have done it often for fun, and have done it three times on the same dog.” Now, this was what Burhius could not do according to Kirkringius ; Kirkringius tells how he was admitted to one of Burhius’s exhibitions which failed, and the dog goes to this day in the streets of Amsterdam blind of that eye. “ Qui canis adhuc hic Amstelodami vivit quidem, sed non vidit illo qui discissus fuit oculo.”

Many pretended to restore to the aged, health and strength, by withdrawing from their system the effete blood, and filling them up with healthy and youthful blood. In like manner, did Talicotius write his long and not inelegant book, about the restoration of parts of the body which had been lost. And Garengot had the boldness to tell a story, about “a young fellow, a soldier, who, reeling out of a tavern drunk with some of his companions, got into a quarrel, in which one of them bit off his nose, threw it into the gutter, and trod it under foot : He gathered his nose up, flung it into Mr. Gallin’s, an Apothecary’s shop, ran after the fellow who had done it, and when he returned, Mr. Gallin washed the nose at the well, stuck it with plasters in its place, in two days after, it was firmly united, and Mr. Garengot four days after, dressed the nose with his own hands.”—Vid. Vol. III. p. 55. And if we may believe one writer of good abilities, the best modern stories of adhesion, (as of a tooth adhering to a cock’s comb,) are little better than Talicotian tales, or this by Garengot of the soldier’s nose.\*

But even when this doctrine of adhesion came to be spoken of in a sensible and modest way, and became a question of the highest importance in practice, it was very difficultly and slowly received.

Thirty years ago, surgeons had no settled notions, that cut surfaces might be made to adhere : they had no motive for saving the skin ; or, when they had saved it, they did not know how to apply it to the other cut surfaces, nor how much it might contribute to a speedy cure : if they extirpated a tumor, they cut away along with it all the surrounding skin : if they performed the trepan, they performed in a most regular manner that preliminary operation which they chose to call scalping ; or, in plain terms, they cut away six or eight inches of that skin, which should have saved the fractured skull from exfoliation, and should have imme-

\* I had neglected to repeat this experiment myself. I mentioned here a doubt suggested by a modern writer. But my friend, Astley Cooper, has since convinced me of the fact.

diately covered and defended the brain : in performing amputation, they cut by one stroke down to the bone ; and, even when they performed the flap amputation, they dressed their stump and flap as distinct fores. An exfoliation of the bone, in these older operations, was a thing unavoidable ; so that it was part of their art and skill to procure exfoliation. And the filling up and final healing of their conical stump with so slow a process ; so imperfect ; and so many exfoliations of the bone, with other lets and hindrances intervened, that it is no wonder their imagination was much occupied about the digesting, incarning, and cicatrizing of wounds. Whenever a bone was laid bare, they believed that it must exfoliate before it could heal ; until they saw this exfoliation perfect, till the bone had at least thrown off an outer scale, they would not permit it to heal ; they would not lay the skin down upon a wound upon the shin bone, if there was a lacerated scalp, they cut the torn piece off ; a large part of the scalp could not be regenerated in less than several weeks or months ; and so they made good their opinion by their practice ; for, very generally in that space of time, the whole, or a part at least, of the exposed bone, was thoroughly spoiled. These were a few of the many mistakes committed daily by the older surgeons ; who were contented with their theories about incarning, and cicatrizing of wounds, too proud of their own art, and too little inclined to follow the simple ways of nature.

It was in the time of discussing this very point of amputation, and especially in debating the subject of flap operations, that this discovery of the universal doctrine of adhesion began. The French surgeons had declared, not only that their flap amputation procured an easy and perfect cure, but they affirmed that often in three days, the flesh of such a stump had adhered. To this O'Halleran replies, with a rudeness and ignorance quite unparalleled. " I would ask," says he, " the most ignorant tyro in our profession, whether he ever saw, or heard even, of a wound, though no more than one inch long, united in so short a time ?" " These tales are told," he adds, " with more confidence than veracity ; healing by inosculation, by the first intention, by im-

mediate coalescence without suppuration, is merely chimerical and opposite to the rules of nature." This was the assertion of O'Halleran, himself an excellent and most judicious surgeon; and all the best surgeons of the present day, as Mr. White, Broomfield, &c. have followed his doctrine and practice; dressing their circular stumps with rolls of fine linen, laid within the circle of the stump; and, when they amputate by the flap operation, they dress the flap and the face of the stump as separate sores, till the twelfth day.

When O'Halleran talked this bold uncivil language about confidence and veracity, he little thought that he should live to see the doctrine of adhesion followed by a universal practice of laying down the flap; or the most ordinary surgeon procuring sometimes a perfect adhesion on the third day. But surgery has improved gradually within these twenty years. Observations have been carefully made, and published early in pamphlets or journals. Doctrine and practice have gone hand in hand. The particular practice of procuring adhesion belongs to no one person; but was passing continually from hand to hand, from one friend to another, the common doctrine and discourse of the day. It was gradually extending in its application, and growing strong, like every practical doctrine, by slow degrees. It was applied first to amputation; then to trepan; then to extirpation of scirrhus mammae; then to all great operations; then to all recent wounds. If we are more particularly indebted to any one man, it is to Al-lançon; who continuing through all his practice to make neat operations, and careful notes, has given us the result, in a form and language which make his writings, notwithstanding the nature of his subject, as pleasant almost as they are profitable to read. And yet, (as O'Halleran says on another occasion, p. 222.) "We must not wonder to find some people, scarcely known beyond their own sphere of action, modestly whispering their claim to this honour." A quotation, which in its sense and true meaning may be fairly applied to the present occasion, word for word,



all but one.\* I have been at pains to represent this improvement as gradual and silent ; as having obtained by general and common consent, by a slow communication of remarks from friend

\* Which of these words my reader shall strike out, I shall leave to his own honour and good sense to determine, after he shall have read the following quotation ; observing, in the first place, that Mr. O'Halloran published his book chiefly with the design of teaching surgeons how to save skin ; that Mr. Allanson published his book to teach surgeons how to put that skin down so as to make it adhere ; and that a third author, the only modern surgeon who has claimed the doctrine, is the only modern surgeon who does not understand its real value. He delivers the following curious history of this doctrine of adhesion : “ As I consider  
“ the improvement by which these ends are effected as one of the  
“ most important in modern practice, I hope to be excused if I  
“ shortly state the share I have had in the introduction of it, before proceeding to describe the operation itself.

“ In the course of my education, while attending the hospital here, as well as the hospitals of London and Paris, the inconveniencies arising from the want of attention to the saving of skin, in different surgical operations struck me strongly, so that I was resolved to take every proper opportunity, in my own practice, of treating this point with particular attention.

“ From the year 1772, when I settled in business, I laid it down as a maxim not to be deviated from, to save as much skin and cellular substance in the removal of tumors, whether cancers, or others, when the soundness of parts admitted of it, as would completely cover the fores,” &c. &c.

“ After this had been practised for several years, Mr. Allanson, of Liverpool, in the year 1779, published some observations upon amputation, in which a method of operating is described,” &c.

The claiming so late as the 1772, or rather the 1788, a discovery which was published by O'Halloran in the 1765, must excite some feelings very different from resentment ; but any one who claims, in the 1788, the doctrine of adhesion, which Allanson had so fully explained in the 1779, must be answered : And the answer is plainly this, that several other passages of the same author show, that he did not even understand what Mr. Allanson was doing, *ex. gr.*

“ When speaking of the time in which stumps may be expected to heal, I think it right to observe that it should not be our object to accomplish a cure in the first instance, without the formation of matter ; it *commonly answers better* when effected in the more gradual manner we have pointed out. When a stump heals suddenly, and the edges of the divided skin adhere by the first intention, the teguments are apt to be puckered and uneven, and the ligatures of the arteries are removed with difficulty, &c.

to friend, till at last the practice was fairly established ; and no man could fully claim an improvement in which every man had some little share.

This universal doctrine and practice of procuring adhesion, has done more for surgery in a few years, and most especially for the surgery of wounds, than any other general observation : not excepting even the greatest of all discoveries, the circulation of the blood. It is now well proved, that skin will adhere to skin, flesh to flesh, bone to bone, and all these parts to each other. One part only of the human body, cartilage, will not adhere ; I have seen many proofs that cartilage does not inflame, nor ulcerate, nor give out granulations, nor generate new flesh, or at least it does so very slowly. A wound heals over a cartilage, but not by uniting with it.—We amputate a toe, and the flaps unite in two days, but still they have united with each other only, and not with the cartilage of the joint which we have cut ; and in a luxated limb, we find that the bone continues displaced, the cartilage never inflames, never unites with the lacerated parts, never in any circumstances adheres. For the process of adhesion is really this : either the arteries of opposite surfaces inosculate mouth to mouth, or rather each cut surface throws out a gluten ; the gluten fills up the intermediate space ; into that gluten, the lesser arteries of

“ It is my own opinion that the secondary union recommended by Mr. O’Halleran is the best. The cure would appear to be in general accomplished more quickly in this way than in any other ; even where the flap has not been applied to the fore till the fourteenth day, the cure has been completed before the fourth week, whereas few, if any, cures have been effected so early where the flap has been applied immediately after the operation.”

A man who has invented a doctrine, very generally understands it, at least as well as his neighbours, and pushes his discovery rather beyond the mark.—But this author “ cares not whether the skin be laid down for adhesion, or whether we dress the flap and the stump as two distinct fores.” In short, far from speaking in the enthusiastic passionate tone, of one pleading for his own discovery, we may know that this does not belong to him by the very token which discovered to Solomon which of the two harlots was the mother of the living child, “ for behold one of the women said, My lord, but let it be neither thine nor mine, but divide it.”

each cut surface force themselves, and it is thus perhaps by the generation of a new intermediate substance, that the continuity and entireness of the part is so quickly restored. If any one point fail to adhere, there the wound must run into suppuration ; because at that point there is a separation of parts, which, being equivalent to a loss of substance, requires the generation of new flesh. When the opposite surfaces consent and harmonize with each other, in their mode and period of action, then they adhere ; and so skin adheres to skin, or flesh to flesh. But if one of the opposite parts enters instantly into a lively action, while another has only a languid action, and enters into that action slowly, and at a long interval of time ; the action of the one has expired, before that of the other has begun. Such parts therefore do not conspire and harmonize in their action, nor can they unite with each other ; but they may live and thrive independent of each other : and perhaps it may happen in this way, that opposite surfaces of skin or muscle, may seem to be adhering firmly to the parts beneath them ; while, perhaps, they adhere to each other only, and merely cover the cartilage or bone, without having any direct connection with those parts. The bone we see, (as in an old amputated limb,) lives and thrives, is not limited in its new formation by the adhesion of surrounding parts, but grows out into a broad knob of callus or new bone. A gristle also, (as in an amputated or luxated joint,) retains its pure and lubricated form.

There are, no doubt, accidents both of the constitution and of the wound, which will prevent adhesion ; for, if the patient be of a bad habit of body ; if he be lying in a foul hospital, in the midst of putrid sores, and breathing a contagious air ; if he be ill of a fever, or flux, or any general disease ; then the properties of the body being less perfect, his wound will not adhere : or, if the wound be foul, made with a poisoned weapon, or left with foreign bodies sticking in it, or if blood be poured out into the cavity of the wound, (for blood in this case is but a foreign body,\*) or if

\* It is not easy for any one who is not an enthusiast in the

there be a wounded lymphatic, or wounded salivary duct, a wounded intestine, or a bleeding artery or vein ; any of these causes will prevent the immediate adhesion of the wound : or if it be a bruised or gun-shot wound, there is a destruction of parts ; the lost parts must be regenerated, and those parts which remain, must enter into a new action for generating new parts, and so they cannot adhere.

This adhesion, then, is a property of the parts of the living body, which is perfect only while their structure is entire ; which operates only where the opposite parts touch each other by the fullest contact, and sympathise with each other in their period and degree of action. It is interrupted if any foreign body be interposed ; it is less perfect in every unhealthy condition of the system—but it is a property, of which we are now so well assured, that we look for its good effects in the greatest as well as in the smallest wounds ; and the union of a hare-lip after it has been cut and pinned, represents the perfection of that cure which we attempt in every greater operation, and more confidently, in every smaller wound ; succeeding sometimes as perfectly after an amputation of the thigh, as after the most trivial wound of the cheek.

This property of re-union in divided parts is proved, by every day's experience, to be so perfect, that where we do fail, (which, no doubt, is sometimes owing to a bad habit of body,) we have much reason to believe, it is owing to some negligence on our part ; some extravasated blood, some open artery, some portion of detached bone left in the wound, or some awkward piece of dressing which lies betwixt the edges, which should adhere ; or most frequently to the want of that perfect and absolute contact, which is so essential to the perfect adhesion, that every part of the wound which does not touch some opposite surface, must suppurate before it can heal. This is my chief motive for putting down carefully, in short distinct rules, the several ways in which a wound may be put together, so as to make it adhere.

“doctrine of life in the blood,” to acknowledge all the very extraordinary conclusions which have been deduced from it.



There is no wound in which we may not try with perfect safety to procure this adhesion : for nothing surely can be more kindly, when applied to a wounded surface, than the opposite surface of the same wound ; it has been but just separated from the opposite surface ; it may immediately adhere to it ; though it do not adhere, no harm is done, still the wound will suppurate as kindly, as freely, as if it had been roughly dressed with dry caddis, or some vulnerary balsam, or acrid ointment : If only a part suppurate, while one half perhaps adheres, then half our business is done : And, in short, this simple way of immediately closing a wound is both natural and safe.

1. A fair longitudinal cut, in the skin only, may be<sup>d</sup> brought together merely by a good sticking plaster ; or by a piece of common black court-plaster in smaller cuts ; or by a plaster of diachylon in large cuts. The plaster should be used in superficial cuts of the face, hands, feet, &c. or even over the fleshy parts, if little deeper than the skin ; and, in naked and bony parts, as in the hairy scalp, or on the back of the hand, compresses, laid upon each side of the cut, will keep its edges in close contact with each other ; and will so support the sticking plaster, as to save the necessity of making a stitch with the needle, which is surely cruel wherever it is unnecessary.\* I have never found it necessary to use hare-lip pins in any piece of skin which lies solid upon a bone, as that of the face or scalp, or the back of the hand. I have never used any thing but plasters merely, after little operations upon the forehead, face, or cheek ; unless there was some loss of substance.†

\* Sutures make knotty scars, and therefore whenever (in the face especially) a plaster will answer the purpose, we should avoid them.

† The older authors choose to call this manner of applying plasters by the affected and absurd name of *Sutura Sicca*, or dry future. In applying such a plaster, we are careful first to let the bleeding subside ;—then to make an assistant put the lips of the wound neatly together ; then we apply one end of the sticking plaster to the skin on one side of the wound, and let it dry and fix there, so that we may pull by it ;—then we pull that edge by the plaster ;—then moisten the remaining half of the plaster ;—then

2. In some looser parts of the skin, especially when moved by strong muscles, we either make a stitch of the needle, or we use rather what is called the twisted future, or hare-lip future, which is the largest of all. Thus the lip, for example, is so retracted by all the muscles of the cheeks, that when cut it gapes much, and requires to be very well secured ; therefore after cutting the edges of a hare-lip, or after cutting out a cancer of the lip, we put the broad edges neatly together ; transfix both lips at points exactly opposite to each other with a large pin, which is called (from this particular operation), the hare-lip pin ; we pass two pins through the lip, one at the very edge, or vermilion part of the lip, and one in the middle of the cut, and then twist a thread about them in the form of a figure of 8. This is named the hare-lip future.

This future may be used in any other superficial wound of the skin. It is less necessary in the scalp, and other firm parts which lie over the bone. It is more necessary in the looser, and especially in the more muscular parts, as in the lip, or perhaps in the cheek. In accidental wounds of the lip, in boys, I have used the common sewing needle, which passes with very tolerable ease.

3. In angular wounds of the skin, a stitch of the needle will be useful, to keep up the corner to the angle which it belongs to ; and this, of course, supports the sides, and keeps them in contact. Then we shall seldom find it necessary to make more than one stitch, and that exactly in the place of the angle ; this stitch will support the angle, and the sticking plasters may be laid so as to support the sides.

4. Long wounds, down to the fleshy parts, even though they have no angle, will need stitches ; if the cut be across the line of lay it neatly down over the opposite edge of the wound ;—then apply successive plasters till we have crossed the whole line of the wound :—Then, if any one of the slips of plaster has lost its hold by the oozing out of the blood, we take it gently off, wipe the surface, and apply a new one neatly, until we have got the whole clean and fair, all the plasters sticking soundly ; and, lastly, We lay a compress over the whole, which we bind down a little with a circular roller, in order to prevent internal bleeding.

a muscle, the gaping will be greater ; if it run along the course of the muscle, the gaping will be less ; but still such as to require a stitch. A long fleshy wound will require stitches, even for that gaping which arises merely from the length of the wound, independent of the contraction of the muscular flesh ; and the stitches must be multiplied, according to the length of the wound ; making, for each inch of the wound, one stitch of the needle.\* From this interruption, these separate stitches have been named the Interrupted Suture. The stitches counteract the general retraction, they keep the separated parts in contact ; but to keep the whole edge of the wound neat, one slip of black plaster must be laid in the interstice of each stitch. These plasters keep the whole wound even ; support the stitches, so as to leave less straining upon these separate points ; and enable you to cut your stitches early out for a reason which I shall presently explain to you.†

\* Perhaps, as a general rule, the following directions from one of our oldest and best authors may be followed.—“ If the wound be of two fingers breadth, make one stitch in the middle ; if three fingers breadth, make two stitches ; if four fingers breadth, three stitches ; and so on, making a stitch less than the wound is in number of fingers : Sometimes in declining parts we make our stitches at a little more distance.”—*Wise*man.

† The older surgeons were very proud of their sutures, and still prouder of the names they gave them. They called it a Continued Suture, when they sewed the wound all along like a seam ; they called it the Glover’s Suture, when they passed their needles alternately from the inside to the outside of the wound ; they also used the Shoemaker’s and the Taylor’s Suture. They called it the Interrupted Suture, when they closed a long wound by interrupted stitches ; and Twisted Suture, when they used pins as in hare-lip ; they called it the Quilled Suture when they used the quills ; the Gastro-raphia, when they sewed a wound of the belly ; and the Intro-raphia, when they sewed a wounded gut.—They had particular needles for sewing tendons ; they had the distinctions of *Sutura Sicca*, and *Sutura Cruenta*, the moist and dry sutures ; i. e. the bloody sutures in which they used the needles, and the dry Sutures in which they used only plasters. But the most absurd and dangerous of all their sutures, was what they chose to call the Restrictive Suture, (or rather they gave the general name of restrictive suture to all close sutures,) intending, by the closeness of their sutures, not only to close the wound, but to bind it so firm as to prevent the bleeding from any large vessel within the wound. Their restrictive sutures were as absurd

5. If the wound be still deeper among the muscular flesh, the stitches cannot go to the bottom of the wound ; the stitches must be supported, and the bottom must be pressed together by compresses, and the uniting bandage : This bandage is made by putting a double headed roller round the part, passing one head of the roller through a slit in the opposite side of it, and drawing both at once.

6. If the wound be pretty deep among the muscular flesh, so that the several stitches of the interrupted future would make, (if tied by the common knots,) an awkward and painful future, likely to excite inflammation ; we then convert the interrupted future into what is called, the Quilled Suture : which is made by splitting each end of the ligature, (after the stitches are made,) into two threads ; then, laying a quill or bougie along each side of the wound, we tie all the ligatures of one side round one bougie ; then draw that bougie tight down, by pulling the ligatures from the other side ; then tie the ligatures also on the other side, round the opposite bougie ; so that the two bougies, like two large rolls, keep the sides of the wound neat and even. The pressure is downwards towards the bottom of the wound, at least, it extends as deep as the ligatures ; so there is less need for helping this future with compression ; but we may still put our sticking plasters in the interstice of each stitch.\*

as the expectation of the first inventors of the flap amputation were, who sewed their large flaps of skin, not to procure a more speedy cure or a fleshy stump, but to prevent the bleeding ; for which purpose they bound down the flap upon the face of the stump, and kept it there with buckles and belts, and all kind of machinery.

\* This is not exactly what was meant by the older surgeons when they used this quilled future : for they supposed that a deep muscular wound could not safely be brought together ; they wished to bring it together at the bottom, but were afraid to close it at the mouth lest that should confine the matter. They used the quilled future with this intention, as best contrived for closing the bottom of the wound without straitening its mouth ; for the thread goes down to the bottom of the wound, but the bougies are far from the mouth, the threads in this, as in every stitch of the surgical needle, being always brought through the skin an inch distant from the lips of the wound.



7. But there is a degree of prudence in refraining from stitches in deep muscular wounds ; for stitches, after all, can support only the edges of the wound, while it is the compress and the uniting bandage that must support all below. Deep muscular wounds, then, should be secured chiefly by the compress and uniting bandage. Stitches should, in such wounds, be used with reserve. Those who have used stitches the most confidently, have been forced, as suddenly, to cut them out again.—A point which is well illustrated by the case of a foldier, who, being wounded at the corps de garde with a sabre-cut across the shoulder, through the belly of the deltoid muscle, his surgeon sewed the wound that night, with many deep stitches ; these M. Pibrac was next morning obliged to cut, on account of convulsions of the arm, which ceased the moment that those cruel stitches were undone.\* —Such deep futures may be fairly enough compared with the cross stitch of Paræus, which killed the patient ; sometimes by convulsions, sometimes by high inflammations, with a total gangrene of the stump.

8. There is also a degree of prudence to be observed in using stitches in unhealthy patients, where we are almost assured, that the parts cannot adhere ; or in foul hospitals, where all kinds of wounds are apt to fall into a foul erysipelatous inflammation, of the low and gangrenous kind. For stitches must always, by exciting high inflammation, do much harm, whenever they do not do immediate good.

9. Whether the wound be broad in the form of a flap, or long and deep, or a penetrating wound, there is much danger, lest the sides of such a wound be not kept in close contact ; in such wounds we lay long or flat compresses along the tract of the wound, keeping them firm with a broad and firm rolled bandage, (what long ago they called the Expulsive Bandage,) which both prevents collections of matter, and brings the sides of the fore into contact. And every surgeon, knowing the intention, must have ingenuity enough to shape his compresses long or flat, or round

\* Mem. de l'Academie de Chirurgie.

or square, according to the form of the wound, and to draw his bandage tighter just as the occasion requires.

10. In deep muscular cuts, where there is bleeding, and considerable vessels are wounded, we first apply the tourniquet, then tie the arteries ; then undo the tourniquet to see that the arteries be really secured ; then screw the tourniquet again, that not even an oozing of blood may interrupt our next operation, viz. the closing of the wound ; then sew the wound according to its nature, or its size, leaving the 'ligatures of the arteries hanging from a corner of the wound ; and, though perhaps the whole will not adhere, yet much will adhere ; we always have our chance of a total adhesion ; the ligature keeps a little part open for itself, with a little suppuration round it, but attended with no pain ; and it comes easily away the fourth or fifth day \*.

11. Even though the bone be wounded or cut up, this still makes no change in our intentions, nor in the surgery of the wound ; for the bone also may adhere, and perhaps the re-union

\* "The way," says Wiseman, "to stop the bleeding, as it is common in all wounds, is by bringing the lips of the wound close together by future, and by applying such medicaments to them as have a drying and agglutinative faculty."—These notions our older writers got from the celebrated French surgeon, Guido de Cauliaco, who says, "*Sutura restrictiva fit, quando aliæ futuræ non fieri possunt* "propter magnum sanguinis impetum."—And he adds, that this, after all, is not a future to be depended upon ; for, if but one stitch burst, the whole gives way ;—"Suspecta tamen est, quia rupto uno puncto, cetera relaxantur."

Guy de Chauliac had in his turn copied from the Arabians in most points, and very expressly in this business of futures ; so that we find this business of the restrictive futures to have begun with the Arabians, who knew the way of using needles in closing wounds, but had not learnt to use the needle in tying arteries, otherwise than by sewing the wound just so much the closer and tighter in proportion to the bleeding ; they directed the future to be made close and firm, like that future which the currier makes, when he mends breaches in the tanned skin.

This is the true history of one of our futures, and the reason of its two names, viz. Restrictive and Continued Suture ; and from this history it may be understood, that even the name should be no longer heard. As for the other use and reason which surgeons have assigned for retaining this future, viz. that of sewing the cut intestine closer, that shall also be discussed in explaining Wounds of the Belly.

proceeds thus : We put down the bone and cover it with the skin in close contact, and the skin adheres ; the bone itself most probably does not, in the strictest sense, adhere ; or at least, its adhesion is different in its period, and in its manner, from that of the skin, and yet it is like it ; for the outward wound is healed, the wounded bone throws out its mucus, that mucus becomes vascular, then bone is secreted ; then a kind of callus is formed to heal the cut bone : and all this process going on within ! The bone seems to have adhered at the very time of the adhesion of its soft parts. But it is very particular that, in all fractures, great as well as small, and of course, in all wounds of the bones, the bone never heals, till the outward wound is first healed, so as to restore the continuity of the vessels, and enable them to begin the secretion of new bone. However the theory shall stand, it is comfortable to be thus assured of the fact ; that, if a bone be wounded or cut, so as to be turned up, or though a piece be cut away from a bone, if that piece still preserve its connexion with the soft parts entire, it may still adhere, live, and be restored. And the general wound may be made to adhere as firmly with a cut bone in it, as if it were a simple cut. How otherwise could we make the surfaces of an amputated stump adhere, it being the largest wound, having in it the largest cut bone ?

12. The last direction which I have to give you, relates to the approach of inflammation ; for I cannot allow myself to call it inflammation, when the part adheres ; this indeed were no better than to call a cure a disease.

The adhesive inflammation (as it is called inflammation) is not attended with fever, pain, swelling, nor redness, unless in the most trivial degree ; indeed that gentle swelling which indicates the fulness, and strong but healthy action of the vessels, it must have ; but the increased action of those vessels, in re-uniting the lips of a wound, stands on the same footing with the healthy action of vessels, in forming or in supporting any part of the system. A bone is formed and completed by the action, fulness, and turgescence of those arteries which are destined to form it ; a spoiled bone is regenerated by an increased action and fulness of those vessels

the callus, which re-unites a broken bone, is formed by a full, but slow and regular action of those arteries, which extend from the ends of the bone, and meet each other ; and whenever vessels, extending either from the ends of a broken bone, or from the edges of any wound in the soft parts, meet each other, the part is entire again ; they form a perfect system of circulation ; and thus from the very first moment of adhesion the vessels begin a healthy action, unaccompanied with inflammation or pain ; and the part is once more entire, and sound. If the vessels become thus entire, from the very moment of their re-union, if neither pain nor inflammation come on, unless the process fail, and the vessels begin to part, how can this be called a disease ? or, by what sophistry can it be comprehended under the definition of an inflamed part ? To speak thus appears to me, to give an incorrect and unfavourable view ; it is to describe the cure, by the very name of the only disease which can interrupt the cure. I must therefore consider the part as going on in a sound action while it continues to adhere, and shall proceed in describing what is to be done if the wound should begin to separate and open ; or in other terms, should begin to inflame.

Adhesion prevents inflammation ; when the parts adhere, they enter into a healthy action, they are entire, and they do not inflame ; whenever any part is not in contact, and does not adhere, it must inflame ; whenever one part is left thus separate, its inflammation may extend to the adhering part of the wound, and so one detached point may endanger the whole. The stitches are themselves a cause of inflammation, (which again is always the cause of the opening and bursting of the wound) ; and so the inflammation around the pins or stitches, endangers the whole. If the stitches be too tight pulled, this bracing up of the stitches inflames the wound ; and sometimes the timely undoing of the stitches, prevents this opening of the wound ; if there be blood poured out under the wounded part of the skin, it separates the skin from the parts below, which is exactly equivalent to the separation of the edges of the wound itself :—that also endangers



the whole. From all which you will conclude, that the moment you observe pain, inflammation, and swelling of the wound, a separation or gaping of its lips, the stitches tense, and the points where the stitches pass particularly inflamed, you ought to undo your bandages, draw out your pins, or cut your stitches, and take away every thing that is like stricture upon the wound ; these prudent measures may abate the rising inflammation, and prevent the total separation of the skin ; while you may still endeavour to keep the wound tolerably close, by the more gentle means of sticking plasters.

But should the inflammation rise still higher, and should you perceive that a total separation and turning out of the wound is inevitable ; you must throw all loose, put a large soft poultice round the whole, and forsake, without hesitation, all hopes of procuring adhesion ; for should you, in this critical juncture, persist in keeping the parts together with futures, the inflammation would, in the form of Erysipelas, extend itself over the whole limb, attended with a fetid and bloody suppuration, wasting the skin, with great loss of substance. Therefore, throw all loose, apply your poultice, allow the wound to separate right as it is, and to pass slowly into a soft and easy state of suppuration ; and then, a second time, try to bring the edges up to one another, not by stitches, but by adhesive straps, or by a gentle bandage.

When the wound has fallen into a full suppuration, then the suppuration, granulation, and all that follows, belong (as indeed adhesion also does), to nature alone ; over which we have no other power than that of supporting the action of the parts, i. e. keeping the system in good health : and when the suppuration goes wrong, it is, in general, by taking the form of a profuse, thin, gleetty discharge ; and this profuse discharge is to be suppressed, and the right suppuration restored by bark, wine, rich diet, and good air : and this is what is usually meant by supporting the suppuration, or moderating the profuse discharge.

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## DISCOURSE II.

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### ON WOUNDED ARTERIES.

OF all the sudden accidents which demand the assistance of the surgeon, no one requires such absolute presence of mind, and such perfect knowledge of Anatomy, as the bleeding from any great artery. I cannot conceive how a man of real feeling can, in our profession, pass one composed or easy hour, without knowing thoroughly the course and value of the great arterial trunks. Without this preparation, the surgeon lies continually exposed to accidents, which may, in a single moment, ruin his professional character, and blight all his fairest prospects of success. Without this knowledge of the blood-vessels, a modern practitioner is much in the condition of those who lived in times before the needle was invented, when the surgeon durst not cut the most trifling tumor, or did it with fear and trembling; when often an operation, apparently easy, cost the patient his life. But with a due preparation, even the youngest surgeon now knows how to speak in consultation, and how to perform his operations; where to be afraid, and where to venture upon a bold and resolute thing. The greater operations are easily done, while the cross accidents of practice, the wounds of arteries, the consultations about aneurisms, and other consultations about organic diseases, are the only proper tests of the surgeon's skill.

Even the few directions which I shall be able to give in this short discourse, will bring this appeal to bear strongly upon your minds, and will vindicate any thing that I might choose to say, either in reproof of negligence, or in praise of diligence, in regard to this the most important of all studies, the study of the

blood-vessels ! to which Haller and Petit, the greatest masters in anatomy and in surgery, had devoted so much of their labour.

The chief questions, in this interesting subject, are these :

1. What is the real importance of a GREAT ARTERIAL TRUNK in any limb ? and what is the true value of its lesser branches, of its inosculating arteries, of those intricate connections, which, in accidents of the main trunk, enable the smaller branches to supply and nourish the limb ?

2. What is the form which a wounded artery assumes ? how is it covered ? What parts form that bag which we call an ANEURISM, and which, both from the danger of its bursting and our fear of gangrene, is considered as a most dangerous disease ? How may the operation, in this wound of a great artery, be most safely performed ?

3. Or since, even by bleedings from the SMALLER ARTERIES, our patient sometimes dies ; how should we manage these smaller arteries ? The needle, the compress, the sponge, the styptic waters, are all of them used, rather, as it should seem, according to the fashion of the day ; or to mere accident or caprice : But are there not certain accidents, or certain parts of the body in which each of these will be found more or less serviceable, according to fixed and steady rules ?

I believe these to be the chief questions ; and if, in the course of these instructions, I should try to teach you your duty according to settled rules, they must be rules belonging rather to the general point of wounded arteries than to the surgery of particular wounds ; whatever general rules I now venture to lay down, you must learn, by your own prudence and good sense, to apply according to the accidents and circumstances of each individual case.

#### OF THE ANATOMY OF THE GREAT ARTERIAL TRUNKS, AND OF THE TRUE VALUE OF THEIR INOSCULATING ARTERIES.

In the managing of bleeding-vessels, the surgeon is not only vexed with the difficulties of tying the bleeding-vessels, but his

mind is discomposed with fears and doubts about his success ; and surgeons who are old in practice, and should know where the danger is, always put this aphorism at the head of their most interesting chapter : “ When the brachial or femoral artery is wounded, though the patient should not perish by the hæmorrhagy, the limb must soon die for want of nourishment\*.” And farther, to excite the fears of the young surgeon, he is told, “ That in such case, the progress towards putrefaction will be very swift.” “ A wound of this kind, very generally requires amputation ;” and of course, not one precious moment is to be lost in delay. If this were the right and legitimate conclusion, my directions about the bleeding from dangerous wounds, should end with a few simple directions about tying arteries with the needle, or in difficult cases, thrusting down a piece of sponge into the wound ! But I am persuaded, that it is our duty in all such cases, to tie up even the great arteries of the thigh or arm, close to that very point where they come out from the body, and I hope to set up an aphorism, at the end of this discourse, the very reverse of that common rule with which it begins.

This important question rests upon two points only ; the anatomy, and the facts : and although we might, by tracing the arteries of the thigh, satisfy ourselves that the inosculations are sufficient, where its great artery is wounded, to save the limb ; yet we can be assured of this only by facts.

The history of this piece of study, viz. the inosculations of the femoral artery, is indeed very curious ; for nothing surely can be more surprising than to observe surgeons, interested as they are in knowing so great an artery thoroughly, disputing every day the question of its inosculations, nay, what is worse than all, in the daily practice of cutting off limbs, fearing lest those very inosculations should not be sufficient to support the limb ; contenting themselves with talking about it merely, not knowing, by actual dissection, whether there be two great branches of the femoral artery running down the thigh, or one only.

\* Gooch, p. 71.







*a. The Arteria Iliaca Communis      d. The Arteria Profunda Femoris.*  
*b. The Arteria Hypogastrica in the Pelvis.      e. The Arteria Articularis Externa.*  
*c. The Femoral Artery.      f. The Cutaneous Veins tying by the Artery.*

# PLATE II



## Arteries of the Pelvis

- a. The common iliac
- b. The Hypogastric
- c. The Gluteal
- d. The Ischiatic
- e. The Pudic
- f. The Thyroid
- g. The Epigastric

## Arteries of the Thigh.

- h. The Femoral Artery
- i. The Great Arteria Profunda
- 1. Its External Circumflex Artery
- 2. Its Internal Circumflex Artery
- 3. 4. 5. Three of its Peroneal Arteries
- k. l. The Popliteal Artery
- m. m. m. its Articular Arteries

n. o. p. the three Arteries of the Leg.





The anatomy of the femoral artery is simply this : The great artery, before it emerges from the belly, and while it still retains the name of ILIAC ARTERY, divides into two great branches ;—the INTERNAL ILIAC, or Hypogastric Artery, which descends into the pelvis ; and the EXTERNAL ILIAC, or Femoral Artery, which goes downwards along the thigh.

Of the INTERNAL ILIAC or Hypogastric Artery, the chief branches go out from the pelvis, through the sciatic notch, or through the thyrioid hole : they escape from the pelvis, go round among the glutæi muscles, and play about the joint of the hip, holding large communications with the uppermost arteries of the thigh.

The EXTERNAL ILIAC or Femoral Artery, having gone down from the belly, and emerged from beneath the crural arch, descends into the thigh. Its first business is to furnish the thick muscles and flesh of the thigh itself ; about four fingers breadth, therefore, below the abdomen, it forks into two great arteries, equal in size ; one destined for the leg and one appropriated to the thigh. That which belongs to the thigh, plunges immediately into the thick flesh of the thigh, sending branches upwards towards the hip joint, and downwards towards the knee ; from its going thus deep it is named the PROFUNDA FEMORIS ; from its spreading itself among the muscles, it was known among the older anatomists under the name of the MUSCULAR Artery of the Thigh. The main trunk of the artery, having given off this profunda, lies superficially along the thigh ; gives none but the most trifling branches to the muscles of the thigh ; goes down to the leg unexhausted ; and its chief peculiarity is, that having descended into the ham, it gives off branches of the size of a crow-quill, three in number, which play round the knee-joint, and are named from this circumstance, the ARTICULAR Arteries of the Knee.

Here, then, the first thing that strikes our eye is that this artery, lying so much nearer the surface, and going downwards towards the leg, should be named, not FEMORAL, but CRURAL

ARTERY ; while the profunda or deeper artery, since it plunges among the muscles to nourish them, is the right and proper artery of the thigh.

The next thing to be observed is this, that the *arteria profunda*, being as big as the femoral artery, supplying the whole flesh of the thigh, running upwards towards the hip-joint, and downwards towards the knee, must have large inosculations ; and, if it can draw blood enough from above, will easily transmit it to the lower parts : In short, that so great a trunk as this must be quite competent to the nourishing of the thigh.

But this conclusion is of too much importance, to be allowed to float thus loose and unsettled in the surgeon's mind. It is not enough, that he thinks and believes that the artery will answer this great purpose ; nor that he hopes to save the limb ; that at least he may try :—He must not only think himself entitled to tie the artery without blame, but he must be able to do so confidently and boldly, and with great hopes of success. To acquire this state of mind, he must not linger in this kind of hesitation ; he should see and examine the precise arteries from which he is to expect a cure. And the necessity of such an examination appears more strongly, when we see surgeons of the greatest experience, directing that every limb, wounded in the great artery, be cut off\*.

When we examine the branches of the *Profunda*, we find the *Profunda* lying a great inosculating trunk, betwixt the arteries of the pelvis and the arteries of the knee ; its first branches turning

\* That these slight descriptions of the arteries, and the arguments which proceed upon them, might be intelligible, I desired my pupil Mr. Mochler to cut up the fore part of the thigh, and show the place where the profunda goes off ; and next, to be at some pains in dissecting out the whole line of the artery, and laying it out upon a board ; from these two steps of the operation, I have drawn the two plates, but still they are to be considered only as hasty sketches ; sufficient for illustrating this point, but not absolutely correct. The one representing, in the form of a drawing, the place of the thigh at which the artery forks ; the other representing, in the form of a plan, the general tendency of the inosculations.

up to meet the arteries of the pelvis ; its lower branches turning downwards to meet those of the knee ; so that although the proper office of this artery is to nourish the thigh, one accidental, but yet important office of it is, to inosculate with other arteries. Thus, by these conjoined offices, the economy of the limb is perfect ; the limb is nourished during health ; and it is supported by new circles of blood, when any accident touches the great trunk.

The anatomy of the Profunda may now be cleared in two short sentences :—First, The two uppermost branches of the Profunda go off from the very root of the artery, almost touching the great Femoral Artery ; they are very large ; they turn quick and suddenly round the hip-joint ; they are named the CIRCUMFLEX Arteries of the hip-joint ; and both these arteries inosculate upwards with the arteries of the haunch, which come from within the pelvis :—Secondly, The Profunda has usually three great branches running downwards, among the muscles of the thigh ; they go through among the muscles, and of course perforate from the fore to the back parts of the thigh ; these again are called the PERFORATING Arteries : they inosculate downwards with the articular arteries of the knee.—Thus, in this slight sketch is chalked out the proposition, which I mean to establish more fully, viz. That the profunda lies as a great inosculating trunk betwixt the arteries surrounding the hip joint, and the articular arteries of the knee ; that the Femoral Artery being hurt in the middle of the thigh, the profunda will, through its lower branches, nourish the leg ; and that the External Iliac Artery being wounded even at the groin, the arteries within the pelvis will press their blood upon the upper branches of the Profunda, so that in like manner those upper branches of the Profunda shall nourish the thigh.

It is strange, I say, that surgeons should have continued merely talking about this artery, or making experiments upon animals, more idle than even the mere conjecture and common report. The great Vesalius scarcely knew the Profunda ; we see it indeed in his plate, but we see it only because we know it, for though it is marked (psi. chi.) and though it is seen inosculating with the

arteries of the pelvis, it is neither drawn truly nor well explained. But still Vesalius observes a very large anastomoses with the thyriod artery, marked (*omega*). Vid. "*Integra totius magnæ arteriæ delineatio.*"—Yet Vesalius's drawing, or plan rather, is much worse than that of Eustachius; for in Eustachius's 15th Table, though we find the Profunda marked, it is not characterized with any of those inosculations, which give it its chief importance in the eye of the surgeon: nor is it described at all even in the explanations of the careful Albinus, who should have put down T. figure 15, as the great "*Arteria and Vena Profunda femoris,*" going down together into the flesh of the thigh. In Verhein, again, this artery is represented; it has its true proportions to the great Arterial Trunk, but it is represented as one long and simple branch, not having that importance, nor those wide inosculations, which constitute its chief character.—Next comes Heister, who blames all former authors, Verhein excepted, for having forgotten this important branch, which, after all, says Heister, "is not so very rare \*." But it may indeed be said, that all authors knew it, while Heister was ignorant of it, a paradox which is easily proved; for Vesalius, Eustachius, Verhein, Cowper, all marked it very distinctly, some with more, and some with less accuracy; yet, as their drawings were intended as plans of the arterial system, it is implied of course, since they did draw it at all, that they understood it to be a regular and constant artery; while Heister knew it only as an accidental artery. Heister began a mistake,

\* "*Hujc tanto magis miror, quod multi magni anatomici nulum prorsus mentionem facerint: cum tamen non sit adeo rarus,*" p. 142. "*Fere omnes anatomici, Verheyenco excepto, unicum tantum truncum et arteriæ cruralis et brachialis delinearunt, ut videre est in Eustachii, Vesalii, imo et in recentioribus præstantissimis anatomicis, Cowpero scilicet,*" p. 149. Let any man, who knows what the Profunda should be, look to Cowper's third Table in his Appendix to Bidloo, and he will there find the drawing of the Profunda, marked 70, nearly perfect, at least as good and as distinct as any other artery in his great plan of the aorta, and more correct than Verhein's. This much is allowable in favour of our great English surgeon, who has been enough accused. Vid. Gulielmus Cowper, citatus coram tribunale Nobiliss. Ampliss. Societatis Britann. Regnæ.

which did not end with himself ; and which must have produced much confusion and apprehension in the surgeon's mind ; for having cured a shoemaker, who, in dropping his paring knife, had struck his knees together to catch it, and wounded the Femoral Artery, Heister explains his opinion of the case, in the following terms : “ If there be only one arterial trunk in this limb, as often happens, neither the compress nor ligature, nor any thing but amputation, can save the patient's life. The limb must fall into absolute gangrene \*.” And so his consultation proceeds in these terms.—First, To try what can be done by a compress and bandage ; as if he had believed it possible to heal the artery, whereas, compression, whenever it suppresses bleeding, must do so by obliterating the cavity of the wounded artery. Next, He advises, if the compress do not suffice, then to open up the wound, and tie the artery ; and, as if the tying of the artery obliterated the trunk more fairly than the compress ; he adds, “ But if, having tied the artery, there should chance to be but one great trunk ;” “ Imo, si forte non nisi unicus arteriæ truncus adesset,” the leg must be cut off ; otherwise the leg will mortify, and the patient must die.

And Heister not only explains himself thus upon an occasion, in which he was particularly interested to understand the Femoral Artery thoroughly ; but he adds to his practical observation, and to his undigested criticisms of Vesalius, Eustachius, and Cowper, a history of the Femoral Artery, worse in all respects than that of any anatomist who had gone before him ; for he says :—“ The Crural or Femoral Artery most commonly descends through the whole thigh, quite to the knee, in one single trunk, giving only very trifling branches to the great muscles of the thigh to nourish

\* Imo, si forte non nisi unicus arteriæ cruralis truncus hoc in femore adesset ; sicut sæpe observari solet, subinde ne ligatura quidem arteriæ læsæ ad sanandum hoc malum sufficeret, quia tunc partes infra ligaturam positæ, ob sanguinis arteriosi hac ipsa sublatum influxum sphacelo corripì solent, ita ut æger tunc sine ablato crure summoque vitæ discrimine servari non possit.



them," p. 141.—" But nevertheless it does sometimes divide in the upper part of the thigh into two great arteries \*."

It is from notions like these that Heister allows himself to say, " If in this case, (as often happens), there should be one great trunk only ;" when in fact, it were as difficult to find a thigh without a Profunda, as without a Femoral Artery.

But this mistake of Heister did not end with himself : there is another surgeon of the present day, who is guilty of calling this a *lusus naturæ*, and of comparing it, like Heister, with the high forking of the Humeral Artery.—Mr. Gooch mistakes this Profunda, calls it an accidental branch, a *lusus naturæ*, an accident similar to the high forking of the Humeral Artery ; he does not indeed clench it with Heister's direct affirmation, "*Scilicet sæpe observari solet* ;" but he writes a paper in the Philosophical transactions, to inform the world of this interesting discovery ; that he had seen three times a double artery in the thigh. The terms in which Mr. Gooch describes this discovery, which he made while performing an amputation, and which he thought might turn out so interesting in consultations about aneurisms of the thigh, are these :

" In this amputation we observed a division of the Femoral Artery into two trunks of equal size running parallel. And so near together as that we could conveniently include them in one ligature with the needle, avoiding the nerve, after raising them up with the dissecting forceps by a small portion of the connecting cellular membrane ; and here we found no occasion to take up any other vessel." *Philos. Trans. An. 1775.*—His amputation was particular only in this, that he had cut the thigh higher than usual.—" The two great trunks lying parallel, and equal in size to each other," were the Femoral Artery and the Profunda, and where he tied, in one great ligature, both the Femoral Artery and

\* "*Descendit arteria cruralis seu femoralis unico tantum plerumque trunco, per femur totum usque infra genu, et ut plurimum tantum minores ramulos ad musculos vicinos prægrandes nutriendos spargit.*" p. 141.

*Interea tamen subinde in suprema femoris parte, in duos magnos quasi truncos se dividit.* p. 142.

the Profunda, there was no great wonder that he found no other bleeding arteries. These are the only peculiarities that I can see in this amputation, and I dare say, his other amputations were very like this. When such an author proceeds, in the next part of his paper, to retail to us his experiments made (with the help of a famous Farrier) upon horses and dogs, it is very allowable to say, that such experiments were more idle than even the mere conjecture and common report. And surely, when surgeons, three years ago,\* could venture to tie the Femoral Artery supported by no better hopes than this ; we, knowing the Profunda, and all its connections with other vessels as we do now, should be very bold in tying the artery very freely, not only in the thigh, but even in the groin.

But the proof of this must be wrought up to a greater degree of certainty, for it rests upon two points, the reasoning from anatomy, and the final authority of facts ; and however strong our persuasion might be, that the patient would recover, though the main artery of the thigh were tied ; yet, until we absolutely see one patient at least recover from such an accident, our opinion is still little removed from that vulgar notion which is implied in such expressions as these ; “ We resolved to try whether the limb might not be nourished by the inosculating arteries.” This hesitating, timorous language is used even at this day, when we have the most certain proofs of this very interesting fact ; for it has

\* The celebrated Professor Murray says, “ I never could find this same double artery in the thigh, which Gooch pretends to have found three times, and believes to occur very often.” “ *Nec unquam mihi arteriam femoralem superficialem duplicem videre licuit, qualem celebris Gooch se ter observasse contendit,*” &c. p. 44. No wonder that Murray never found any such thing, for Murray knew what the Profunda was, and perhaps was not so well acquainted with the English language, as to understand that Mr. Gooch was calling the *arteria profunda*, *alufus naturæ*, a double Femoral Artery, &c. and was looking out for it in horses and dogs. That Gooch did not know the Profunda, is plain from this, that he never once mentions it in his Surgery, nor in his Royal Sociey paper. Mr Gooch’s opinion, and indeed his experiments, are repeated in that edition of his Surgery, which was published in 1792.

been tried, and it has succeeded also, to a degree which our reasoning from anatomy could hardly have led us to expect.

The operation for aneurism of the ham, or aneurism in the middle of the thigh, never fails from want of a free circulation ; though, no doubt, it often does fail from another cause, for so great an artery is not easily commanded ; it is not compression nor even ligature, that will always do ; and this great artery often bursts out. Many patients have died suddenly in the night, many also have died of successive bleedings, which the surgeon could neither prevent nor suppress ; while death from gangrene has been extremely rare.

I think I am safe in saying that, in all cases where our ligatures can command the artery, our patient is safe ; which is tantamount to saying that, wherever we can force the blood towards the inosculating arteries, they enlarge : and operations for popliteal and femoral aneurisms, for aneurisms in the ham and thigh, have succeeded so often, both in recent accidents, and in old diseases, that on this point we need have no fear ; I need not labour to prove to you a thing so generally known. But it is of importance towards giving you confidence in all accidents and difficulties, that I explain to you how possible it is to tie the artery in the groin, and save the limb ; an argument which I enter upon the more willingly, as it includes, a fortiori, the doctrine of all lower wounds.

When we observe the free inosculations of the Profunda, with the articular arteries of the knee, we are encouraged to tie the Femoral Artery any where below the root of the Profunda ; and seeing that it is the Profunda which saves the limb, we tie the artery in the thigh, as freely as in the ham. We are encouraged by these slender inosculations round the knee joint, to tie the artery any where below the giving off of the Profunda, and when we compare with these the high inosculations formed by the upper branches of the same Profunda, ascending and encircling the more fleshy joint of the hip, we need not want courage also, to tie the artery in the groin. These upper inosculations, belong to an order of arteries large in proportion to the limb they nourish : just as the

arteries of the knee are delicate, in proportion to the smallness of the leg ; and I am persuaded, that in good time, the accidents of practice, and the boldness of the surgeon, will make our apprehensions about success in this case appear as childish as the notions of the older surgeons, who had their amputation instruments in good order, whenever they ventured to operate for aneurism in the arm.

Guattani was called to attend a young man, who had an aneurism of the Iliac Artery, at first small and limited to the groin, lying close up under the ligament of the thigh, seeming indeed to come from within the pelvis. But soon after Guattani had begun to apply his compresses, (viz. in one month after,) and while the tumor seemed yielding to the compression, it burst suddenly during the night, with intense pain, so that they were obliged instantly to cut the bandages and give him relief ; then immediately the blood pushing forwards among the cellular substance which surrounds the psoas muscle, produced so sudden an enlargement of the tumor, that Guattani, at next visit, saw that all hopes of a cure were now at an end. In a few days more the tumor filled the whole of the hypochondrium, came plainly from within the pelvis, and going along the groin, extended quite to the middle of the thigh. With this prodigious tumor beating strongly, and filling the thigh and haunch both within and without, the man lingered for three or four weeks, and then died. “ This case,” says Guattani, “ excited in me a great desire of investigating the whole course of the Femoral Artery ;” and in this enquiry, we find Guattani discovering and proving more than he himself knew of, and much more than the celebrated Murray will allow ; for Murray says, “ although Guattani was able to inject tepid water, tinged with yellow from the arteries of the pelvis, round into the arteries of the leg and thigh ; yet I suspect strongly that the grosser fluid, the blood, would pass through the same channels more difficultly, nay so sparingly as not to nourish the limb.\*

\* “ Licet enim ex Cel. Guattani experimentis constet, aquam colore flaveo tinctam et calefactam, si arte in Arteriam Iliacam internam pellitur, arterias femoris larga copia penetrare, hisque

But the fact, as it stands in Guattani, is this : First, He found by dissecting, in going carefully along the course of the femoral artery, that it was straitened from the groin down to the ham, where it was almost obliterated. “ I thought, indeed, says Guattani, that the Popliteal Artery was absolutely obliterated, till by examining more carefully, I found that it could just receive one of Anell’s wires\*.” Now, since Anell’s wire is no bigger than a bristle, may we not say that it was obliterated, that no blood passed that way, that the limb had lived from the time of the bursting of the aneurism, and during the gradual obliteration of its great artery, only by the inosculations along the back part of the thigh.

Secondly, Guattani found, by the injection of tepid water tinged yellow, that the blood had gone round by the branches of the Gluteal, Sciatic, and Pudic Arteries ; that, in short, it had gone round by the arteries from within the pelvis surrounding the hip, into the Tibial and Fibular Arteries below the ham.

This is the most singular fact in the whole pathology of aneurisms ; for the blood which had nourished this limb had moved not only through the common inosculations round the hip-joint, but it had gone by the most circuitous course, and to finish its circle, the blood must have passed through three series of inosculating vessels : Thus, the blood came not from the upper inosculations of the Profunda into the trunk of the Profunda, and so round the haunch by a short circle, into the great artery of the thigh, but must have proceeded first through the Gluteal and other Arteries of the Pelvis into the Articular Arteries of the hip ; then from the Articular Arteries of the hip into the Profunda, which is their parent trunk ; then it had gone down from the main trunk of the Profunda along those lower branches of

*abscessis ex minoribus ejus furculis abunde defluere ; vereor tamen ne liquor crassior qualis sanguis est, multo difficilior eandem pervadet vias, vel latices hujus vitalis portio ægrius transmissa insufficiens prebeat membri nutrimentum.*”

\* Sed re accuratius inspecta, cognovi, tantum in arteria cavi relicto, esse ut Anellianum specillum posset admittere, quamvis id ægre fieret, &c.



the Profunda, which are named its perforating arteries ; then from these the lower extremities of the Profunda it had passed into the Articular Arteries of the knee, and by this last inosculation the blood once more had access to the trunk, *viz.* to the Popliteal Artery, where it divides into arteries for the leg. In short, it had happened in this case, as must always happen, that the smaller arteries grew stronger in both functions at once, *i. e.* that the arteries turning round the hip were both so much increased in size as to be able to carry a sufficient quantity of blood for nourishing the thigh ; and their inosculating extremities also were enlarged in like proportion, so as to transmit a sufficient quantity of blood for nourishing the leg. The blood had passed all along by these vessels which lie upon the back part of the thigh, leaving the Proper Femoral Artery dry of blood, and almost closed all the way from the groin, or rather from within the pelvis, down to the ham ; and I call upon Murray, with all his knowledge of the blood-vessels, (and no other man knows so much about them as he does,) to point out any other passage for that blood by which the limb continued to live.

Another thing also deserves notice in this very interesting case, *viz.* that in their natural and undilated condition, the arteries round the haunch will not transmit the blood thus freely, even through one inosculation, much less through three succeeding series of inosculating arteries ; and this circulation of the yellow water used by Guattani was thus free, merely on account of the gradual dilatation of the arteries in this disordered limb : For Guattani after this made an experiment upon the arteries of a sound limb,\* which explains to us how vast the difference is betwixt the

\* Guattani does not mark the difference betwixt his experiment and his dissection ; but his experiment was this : First, He placed his injecting tube above the Hypogastric Artery, then he tied the Femoral Artery in the groin, and threw in his injection, and it went round easily into the Profunda Femoris ; which he explains by saying. “ *More satis copiose perfluxit.*” Next, He made another ligature upon the great artery in the ham, by imitating the obstruction in this case of aneurism, and he forced the injection round in a second inosculating circle, *viz.* by the Ar-

condition of arteries in an aneurismal limb, and in a sound one.<sup>\*</sup> Thus, the conclusions are these :

1. That a fine injection of coloured water, which will not pass through the vessels of a sound limb, will circulate freely in the dilated vessels of an aneurismal limb.

2. That not this yellow water only, which Murray speaks so lightly of, but also the circulating blood, will pass freely all the way from the arteries within the pelvis to the artery in the ham ; for this leg lived a month after the bursting of the aneurism, during which time the inosculating arteries continued enlarging and the great trunk contracting, till at last the trunk was entirely obliterated, and the inosculating branches carried all the circulating blood.

3. That we are safe not only in tying the artery in the thigh, but in tying it in the groin ; for in this case the blood came down by the back part of the limb. The arteries were obliterated upon the fore part of the limb ; yet it was not by gangrene of the limb that this patient died.

It is not from my being limited to this single case, that I here press the point so strongly ; I do this only to make it clear, while I have many other cases in reserve, which will perhaps prove the point as fairly. For example, when the celebrated Heister laid a large compress upon the wound of the Femoral Artery ; and laid a succession of firm compresses all along the course of the artery from the wounded part, quite up to the groin ;† when he bound

ticular Arteries of the knee, where of course the injection was a little retarded, but still flowed out indeed "*liquorem sane effluere conspexi,*" but infinitely less easily, "*sed longe lentius, parcissime.*"

\* My friend, Mr. Harkness, cut off the thigh of a very big and strong man, on account of an aneurism of the Femoral Artery complicated with a fracture of the thigh-bone ; and although the blood had been interrupted only for three weeks, he needed to take up twelve great arteries with the needle, and still left the stump bleeding at every point.

† This was Heister's contrivance for suppressing the bleeding in the case of the Shoemaker.

these compresses by the tightest rollers, drawn with all his strength ; when he continued a compression which suppressed the bleeding from a wounded Femoral Artery for three weeks ; what did he do ? Is it to be supposed that these large compresses merely suppressed the stronger action of the artery, and kept its wounded lips in contact, till they healed ? Surely not ; no one who has ever seen the lips of a wounded artery will expect such a cure : for the lips of a wounded artery are so callous, and so turned away from each other, that the wound of an artery, struck even with a keen lancet, resembles (as the celebrated *Monro*, the father, observes, in describing an aneurism of the arm,) rather a round hole struck with a punch. When *Heister* applied his compresses and bandages so as to suppress the bleeding, surely he compressed the artery ! When he compressed the artery, surely he put its sides together ! When he obliterated thus the canal of the artery, the force of the blood fell upon the inosculating branches, and they would soon enlarge to such a degree, as to carry freely all the circulating blood. The circulating blood would no longer seek the main trunk of the artery, which therefore would contract by being empty ; and its walls would adhere at that point where it was particularly compressed : *Heister's* cure by compression, would resemble, in all essential points, the cure by ligature ; in this only it would differ, that, besides being tedious, painful, uncertain, the cure by compression would obliterate both trunk and branch ; for since the *Profunda* lies directly behind the Femoral Artery betwixt the compress and the bone, against which the artery is compressed, the compresses would obliterate the *Profunda*, as well as the Femoral Artery, leaving nothing to support the limb, but that series of inosculating arteries running along the back part of the thigh ; the value of which I have just explained. In short, the *Profunda* lying so directly behind the Femoral Artery, as to be taken up by *Gooch* in the same ligature, may very reasonably be supposed to be affected by the same broad compress which covers the Femoral Artery.

But there is also another phenomenon in diseases of the Femoral Arteries, which is very interesting, and which proves this point

completely ; for, independently of operations by ligature or compression, we have evidence in the natural cures, (as sometimes nature herself performs the cure,) that the Profunda may be cut off together with the Femoral Artery, and yet the limb be preserved. We see, for example, a great aneurismal tumor of the groin, we see it increasing rapidly till the skin threatens to fall into gangrene, and we are for some days waiting in great anxiety and fear for that last change, in which the skin is to burst, and the patient to expire with one sudden gush of blood. Then the fever begins, the beating of the tumor ceases, the skin becomes livid, the whole limb is cold and without pulse, every thing seems to foretell an instant gangrene. But these, which are so often the mortal signs of gangrene in the whole limb, are sometimes rather the prefaces of a happy cure ; for either the clotted blood has so accumulated, or in the natural aneurism, (*viz.* that proceeding from a dilatation only of the artery,) the looser coagula have so fallen down from the walls of the aneurismal bag into the main channel of the artery, as to stop the circulation from the groin downwards, in both the arteries of the thigh. Such obstructions turn aside the current of the circulation, new channels are found for the blood, and, as it begins to flow more freely in these, the pulse, the heat, the feeling of the limb, are all gradually restored ; they are perfect in a few days, the patient awakens from the low delirium which accompanied the first alarming signs, and not only his life is safe, but, in a little while, his limb also is perfectly restored.\*

Nay, a thing still more singular has happened, very nearly the same process has performed the cure ; with this variety, that, during this natural cure, the tumor bursting, has laid the limb so open, that the surgeon has (if we may be allowed the expression) been able to look into the limb, and see how the vessels were affected from the groin quite down to the ham. “A young

\* Cases, of this nature, may be seen in the London Medical Journal by Mr. Joart Simmons, in the Medical and Surgical Transactions, and in other collections.

man having an aneurism of about three weeks old in the groin, it grew in a short time to such a size, that, after giving him excruciating pain, it burst inwardly, upon which the tumor flattened and extended downwards towards the hip; with relief of pain and increase of the œdema, which had for some time affected the leg. The leg, now cold and motionless, was in danger of present gangrene; but, in forty eight hours, the limb seemed to recover, the œdema lessened, the tumor burst irregularly about the groin, and discharged its contents, partly a thin sanies, partly clotted blood. In eight days, the whole tumor or, in other words, the whole thigh, fell into such gangrenous suppuration, that it lay entirely open. The Sartorius, Pectinalis, Triceps, and all the muscles of the thigh were naked, and as if dissected. In the bottom of this great triangular hollow, lay the insertion of the Psoas Magnus also bare.\* This gangrene of course penetrated quite to the Inner Trochanter of the thigh bone, and laid open all that part of the thigh, in which the nerves and great vessels lie. This triangular cavity extended from the ligament of the thigh to that part of the triceps, at which the vein and artery pass from the fore to the back part of the thigh, and in all that space, nothing was to be seen but the muscles clean separated, or dissected as it were, by the gangrene. The great nerve, vein, and artery were entirely gone; nay farther, the surgeon, the celebrated Petro Javina, was obliged to push his finger up under the ligament of the thigh, and to make an incision there, that the matter from within the pelvis might come down more freely. It is not wonderful that the patient, lying in this most miserable condition, died slowly, wasted by his disease.

There needs no experiment of injecting yellow water, to explain to us what had happened in this case. That the patient lived one

\* Hinc factum est, musculus, Pectineo, Iliaco, atque Psoas parte infera, sartorio, anteriori, denique tricipitis portione, denudatis, et a putredine vindicatis, triangularem alveum, postremis hisce geminis præcipue interclusum, ab inguinis ligamento ad sedem usque, qua decussatim implicantur, vasis, nervisque cruralibus in eodem alveo excurrentibus, a putredine penitus destructis, expoliatum rubentemque apparuisse.—GUATTANI.



month after the bursting of his aneurism, the thigh lying open all the while, is sufficient proof that the limb was nourished ; and such a limb having lived, satisfies us also, that the thigh may survive after the Femoral Artery is interrupted, after the Profunda also is cut off along with the Femoral Artery, and also after the common Iliac Artery is burst absolutely within the pelvis. But, in justice to this interesting subject, I must lay before you one case more, which I am induced to do for two reasons ; in the first place, the case is perfect, the patient having lived ;—and, in the next place, I have but to present the case to you in a fair translation, the chief accidents of it are already explained ; and if you reason for yourselves, as I have argued on the other cases, you will find it clearly proved, that, in the following cases cured by the celebrated Guattani, not only the Profunda was compressed along with the Femoral Artery, but that the External Iliac was so compressed also at the passage from under Poupart's ligament, that every artery on the fore part of the thigh was stopped.

“ A goldsmith, of the name of Morellus, fifty-five years of age, consulted Guattani about opening a tumor in the groin, which all the other surgeons declared had come to a perfect suppuration. Morellus had, during the whole winter, complained of a settled pain in the right groin, sometimes milder, sometimes very violent, but never absent, accompanied during the winter only with a degree of lameness, but now in the spring it had begun to swell. When this unlucky Morellus, going along with others, on the 4th of June, to St. Peter's, to see the pompous ceremony of the consecration of the host, was seized suddenly with such dreadful pain, that he was obliged to go home, and partly from fear, partly from the violence of the pain, went to bed and lay for three months under the care of his physicians, their prescriptions all ineffectual, his disease increasing daily ; and the unfortunate Morellus, now almost hectic, was entirely confined to bed. There was great swelling of the groin, contraction of the thigh, (so that he could not stretch it out) and a distinct fluctuation of the groin, which extended from the Symphysis Pubis to the spine of the Ilium, but still without tension or pain ; but, on the contrary, the

fluid fluctuated freely, and seemed to be immediately under the skin.

Guattani could not allow himself to believe this to be a proper suppuration, because the fluctuation brought no relief ; and tho' there was no pulsation, he yet suspected aneurism, and explained himself on this head to the consulting physician and surgeon, Amicio and Maximinus, both professors in Rome. They agreed to spend a few days longer in trying common remedies, partly that they might make a trial of such remedies, but chiefly to allow time for Guattani to make up his mind concerning the nature of this disease.

After fifteen days, they found no change, except a new suppuration within four fingers breadth of the great trochanter, and, therefore, resolved to do the operation, and to cut in the groin as the place the most favourable for stopping the flux of blood, in case of Guattani's fears about aneurism being well founded.

But lest the assistants or friends, and more especially the patient himself, should be alarmed with the sight of blood, Guattani talked over this subject with the patient, assured him that he had provided every thing for stopping the blood, explaining to him at the same time, how easy it would be to enlarge his small incision, in case of there being pus only in the tumor, and explaining also, that, in case of pure blood flowing, he would presently give it a free exit, so as at least to empty the bag, and would let the fresh blood run still, even after the emptying of the bag, if his strength would bear it. After which, he pledged himself to secure the artery by compression, if he could only get his compress fairly put down upon the artery itself. After all this, says Guattani, I trust there will come on a good suppuration, and that you will be restored to perfect health ; at all events this is expressly what must be done, and all that can be done to attain that desirable end."

"Morellus heard me," says Guattani, "with a composed mind, and we proceeded to our operation boldly ; being provided with basons for receiving the matter, and compresses and bandages for commanding the blood. Then the surgeon Maximinus introduced his curved bistoury delicately into the highest point of the tu-

mor, near the *Crista Ilii*, where the skin was particularly thin, when instantly pure blood gushed violently out, to the great alarm of all present. But encouraging the patient, I took one of the basons, says Guattani, in my own hand, and extracted such quantities of blood by this small opening, that I filled one bason, took up a second, and still continued my work, till the pure arterial blood began to flow, and the patient to faint." The blood was stopped by Maximinus clapping his thumb upon the orifice : and Guattani, by graduated compresses one above another, with firm bandages, so suppressed the bleeding, that the patient did not faint, but, on the contrary, was presently relieved from all his fever and pain ; and, being supported with cordials from time to time, he went on without either bleeding or any other bad symptom, and without their needing to touch the bandage till the 13th day, when, the dressings being removed, nothing flowed from the wound but a little pus ; which shewed that the artery was fairly closed, and encouraged them to go on with the cure. Although the suppuration was not excessive, they were forced to make a counter-opening, and accomplished the cure in little more than two months.—Now the coagulated blood at first, and the fresh blood after, the patient's feeling no lowness during the emptying of the bag, and his fainting when the pure blood began to run, prove this to have been an aneurism, and Guattani did wisely in allowing some of the arterial blood to escape, that he might have a greater command of the artery, and be enabled to compress it.

Now, it signifies nothing to the point, whether this was or was not an aneurism ; nor, if it were truly an aneurism, does it signify whether it were an aneurism of a branch only, or of the main artery of the thigh ; nor whether the aneurism were above or below that point at which the *Profunda* goes off. The question is, whether the main artery was stopped above the *Profunda* by the violent compression which they needed to make ? And this is solved by Guattani's reflections upon the case, which are these two only.

" This case settles, says Guattani, two great questions which disturbed me very much ; for, in the first place, the pressure was such as to prevent the least drop of blood from passing down the

artery ; whence I was satisfied that the limb was nourished by the Internal Iliac Artery alone ; and since this aneurism was cured by compression merely, I am satisfied that compression will cure any aneurism, whether from wounds or from disease."

The strong conclusions of this case also the celebrated Murray tries to escape, by saying, "*Vero simile videtur, Arteriam Femoralem supra inguen jam divisam fuisse, nam alioquin, toto trunco compresso, vix ausa tam fortunatè cessissent.*" But far from its being likely that the Femoral Artery divided above the groin, it is impossible for the Femoral Artery to have divided within the pelvis into two arteries destined for the thigh. The Iliac Artery does indeed divide within the pelvis into two arteries, but they are natural ones, *viz.* the Hypogastric Artery, going from within the pelvis to supply the hip ; and the Femoral Artery, descending along the thigh.

Thus you perceive that this question, whether to tie the Femoral Artery in the groin, or to cut off the thigh, is a matter of serious importance ; that there are every where proofs of its safety, if we will but seek them out ; that there are every where doubts also about the safety of it in the books of the best authors, (for among the best authors the celebrated Murray must rank very high) : But upon these proofs and reasonings I think my conclusion stands firm ; that, though our ligatures will not always hold ; though it is never easy to command so large an artery as the Femoral Artery at the groin ; though successive inflammations and the deep driving of blood will often hurt the inosculations, and prevent our success, yet some have been absolutely cured by tying the Femoral Artery at the groin, and the bodies of those who have died have proved how possible it was to have made a cure, and that in this, as in other aneurisms, the difficulty is not that nature, on her part, has failed to provide sufficient inosculations, but that the surgeon cannot, on his part, secure the great artery, so as to obliterate its canal, and make its internal surfaces adhere.

The surgery of the other great arterial trunk, *viz.* the artery of the arm, stands precisely in the same circumstances, *i. e.* its in-

osculations are perfect, and yet they are not known; for the rule of practice, which directs us in wounds of the Femoral Artery to cut off the thigh, concludes commonly with a more violent declaration concerning the danger from wounds of the Axillary Artery: "But if the Brachial Artery be wounded near the Axilla, or if the Axillary Artery itself be wounded, it is necessary to take off the limb at the joint."

If a man will look only superficially on these matters, or will be satisfied with a general conclusion deduced from the accidents only of one particular case, then indeed he will be hurried along into this rash practice of cutting off arms as well as legs: Or in other words, if, to establish this rule of surgery, nothing more were required than an authentic case of a wounded Axillary Artery, followed by gangrene and death, such proofs might be found in every common book. Thus Mr. Gooch tells us, p. 76. "That he was called by a neighbouring surgeon to attend along with him a man, who had been just before, in a state of excessive intoxication, thrown from his cart, the wheels of which had passed over the top of his arm and shoulder, bruising all the parts quite up to his neck, while an iron hoop projecting from the cart had cut him under the arm, tearing fairly across the artery and all the great nerves which go down along the arm."

"The limb was wholly deprived of sensation and motion, they felt no pulse at the wrist, and they concluded that the Brachial Artery was divided, although the bleeding, which was at first profuse, had stopped, partly by the retraction of the artery, and partly by their having tied down his arm to his side."

"Had not the drunken condition of the patient, and the violent contusion of the parts surrounding the joint, discouraged us, says Gooch, we should have proposed immediate amputation at the joint. The next morning the arm appeared in different parts discoloured, emphysematous and gangrenous; by noon it was totally dead and insensible to the fingers' ends; and on the third day towards the evening the patient expired. The day after his death, the arm was so thoroughly putrid that we were unable to dissect it, till after having washed it well with warm vinegar and



spirits, we opened it, and found the bundle of the great nerves entirely cut across, and the artery also divided, and its upper end retracted an inch into the Axilla."—But this, far from being a general proof, is an accident merely : it is explained by the general circumstances of the case ; the inebriation of the patient, his loss of blood, the cutting of the whole bundle of the Axillary Nerves, are of themselves sufficient to account for his death. Perhaps he died as Captain M——did, whose case is related by the celebrated Mr. White, rather from his inebriation, loss of blood, and wounded nerves, than from the necessary consequences of his wound. Captain M——'s arm preserved its circulation ; the natural heat had returned ; the vein swelled upon putting a ligature round the arm, and he died after the arm was safe from all danger of gangrene.

But this case, related by Mr. Gooch, was complicated with other accidents ; for we are told that they were deterred from amputation, by the bruised condition of the parts surrounding the joint. The wheel had passed along the arm and shoulder quite up to the neck ; these parts were black, and, I dare say, little better than gangrenous : It is no wonder, then, that an arm so mangled, upon a body so hurt and disordered, fell into immediate gangrene.

Hence we see the folly of deducing any general conclusion from an individual case, and we are thus farther reminded of this good rule in philosophy, that one positive evidence must outweigh any number of negative proofs. If we can find one single example of an Axillary Artery wounded, and the arm saved ; it is then a settled point, that in favourable circumstances the inosculating arteries round the shoulder will save the arm ; and the conclusion stands so firm, that, though there should be produced against that single recovery a whole host of negative proofs, it evidently becomes our duty, whenever we are presented with such a case seeming to contradict this positive proof, to search into the circumstances and accidents which have made that one case fail, while another has been followed by such perfect success. As the

purest case, the least complicated, and the most unequivocal example of this success, I put down the following :

“ About sixty years ago, Mr. Hall was called to a man in Cheshire, who had received a very considerable wound, just below the Axilla, by a scythe which had divided the Brachial Artery. The man soon fainted away with the loss of blood, which preserved his life, as nobody was near him. Mr. Hall, being only accidentally in the neighbourhood, had no needles with him ; but, as soon as he arrived, he easily laid hold of the artery with his finger and thumb, till he could procure some thread, which he immediately tied round the vessel, and effectually secured it. *The man recovered the use of his arm ; though he had ever after a weak and trembling pulse\*.*”

It was the broadness and openness of this wound, that enabled the surgeon to see the bleeding artery, to take it up so fairly, as to save at once, both the life and the limb of the patient ; for in many other cases, it has only been by consenting to lose the limb, that the patient has saved his life ; or, where the limb has been saved from amputation, it has in general hung lifeless, and like a piece of mummy by his side.

If it were worth while, I should be careful to explain the chief accidents of this kind, so as to prove the following positions : That the wound of the Axillary is less dangerous still, than wounds of the Femoral Artery : That, when gangrene has seemed to proceed from a wound of the Axillary Artery, it has been owing rather to the complications and accidents of the case : That when, together with a wound of the artery, the bones are fractured, or the soft parts bruised, as with a waggon wheel, the cure will be almost impossible, and the parts must fall into gangrene : That where, by the force of the artery driving the blood inwards, the Cellular Substance and the interstices of the muscles are filled, or, as I may say, rather injected with blood, there we shall have a slow and tedious cure ; that, if the inosculating arteries be torn by a lacerated wound, or their circulation disordered and interrupted

\* Vid. White's case of Captain Mounsey.

by a high inflammation and swelling of the parts, this also will make a very doubtful case, in these circumstances also, it must be dangerous to attempt the cure. But all these do not belong to the general question ; they are merely the peculiarities of the case ; they are the very points to be debated in any great consultation ; but they are not arguments for a general rule. Let, therefore, the surgeon do as he sees prudent in cases of wounded arteries, with lacerated wounds, broken bones, a disordered system, a weakly habit of body ; but, on account of a simple wound of the great artery, he should not allow himself even to talk of the amputation of the limb.

Although I am satisfied that I have explained to you the true grounds of this rule of practice, yet I should feel as if there were something imperfect in the proof, unless I said also here, as I did in speaking of the lower extremity, a few words about the inosculating arteries. The arteries which go round the joint of the shoulder, may be very properly compared with those which belong to the hip joint ; the one set of arteries goes round the Scapula, as the other goes round the haunch bone, and the one is as well able as the other, by free inosculations, to supply the limb below. First, one great artery comes from within the chest, passes transversely across the root of the neck, crosses over the shoulder, and going down over the Scapula, should be named the SUPRA-SCAPULAR Artery, and is one upon which we may chiefly rely.\* Secondly, other branches come off from the artery without the chest, from the deepest part of the Axillary Artery, where it lies high up in the axilla. These, as they turn over the lower part of the Scapu-

\* This artery is regular, as far as relates to the Scapula, but in its origin it is quite irregular. This great artery, going over the Scapula, named Supra-Scapular artery, or *Arteria Dorsalis Scapulæ*, most commonly comes from within the chest, being the first great branch of the THYROID ARTERY ; sometimes it proceeds from the CERVICALIS, or artery of the neck ; sometimes it comes off upon the outside of the chest ; it makes large inosculations and is the branch particularly to be depended upon ; but all the Cervical Arteries assist with their lesser inosculations, and all of them, or any one of them, may be so enlarged as to perform this office.

la, should be named the SUBSCAPULAR Arteries, and they have free inosculations with those above. The third great artery coming off from the general trunk of the humeral artery, is a great muscular branch, which runs down along the back part of the arm; belongs chiefly to the muscles and (like the muscular artery of the thigh,) this also is named PROFUNDA. And whether the great artery be wounded just where it comes from under the clavicle, *i. e.* betwixt that great branch which goes over the Scapula, and that which goes round the Scapula from below; or whether it be wounded betwixt the lower Scapular Artery and the *Profunda*, still the limb is safe; we are assured of it by cases; we foresee the success of all such operations by the success of our injections; I have often found that when, even in the oldest subjects, I have pushed injection (of the coarsest kind,) from the arch of the aorta, trying to save the arteries of the arm for a second injection, by tying both arteries in the axilla very securely, I have notwithstanding had an injection of the arteries of the arm; sometimes in both arms, more frequently only in one; but even one experiment of the kind, and one arm injected, were a sufficient proof.

And you will be inclined to remark this proof as a very strong one, when I inform you that our coarsest injection goes thus freely round the inosculations of the shoulder, (where we are so much afraid of performing an operation,) while even tepid water will not pass, or will scarcely pass round the inosculations of the elbow, where in our operations for the common aneurism, we are so sure of success.

As for the inosculations in all the lower parts of the arm, no doubts about their sufficiency trouble us now, although this also is a degree of confidence and boldness in surgery which we have attained very slowly.

I have already mentioned that, whenever a surgeon ventured to perform the operation for aneurism at the bend of the arm, he was careful to have his amputation instruments ready, and we find the celebrated Ruish speaking of this operation in such terms: "This is an operation which surgeons chose rather to describe,

than to perform, I have good reason to say so, since, for more than 20 years, in all this great city to which so many under all kinds of ailments crowd for assistance, no surgeon, as far as I have heard, has ventured to tie so great an artery\*.”

Heister believed, that wherever we cured the aneurism of the arm by tying the artery, the arm was saved, by a high forking of the artery, and it was only latterly he began to suspect that the smaller branches might sometimes be so far enlarged as to carry the blood freely; because he occasionally observed, that after the operation for aneurism there was no pulse in the wrist during three days, after which it began to be perceived, and soon returned to its natural strength.†

“If the Axillary Artery be wounded,” says Mr. Gooch, “it is necessary to take the limb off at the joint; yet as there are instances of the Brachial Artery dividing into two, soon after it leaves the axilla, which *lusus naturæ* I have observed at different distances in the arm, it will be rational practice, when we feel a pulsation at the wrist, to treat such case as an aneurism, by tying the artery,” &c. p. 72.

In short, there were two accidents with which the older surgeons encouraged one another to this operation, *viz.* that the artery often forked very high in the Axilla; or, secondly, that in common an artery touched with the lancet in bleeding was prick-

\* It is commonly said, that Ruish was actually the first who had performed this operation in Holland; whereas, the passage stands thus: “Operationem sane ab authoribus majus commendatam et laudatam quam institutam; quod dicere non gravor, quia viginti abhinc annis, et quod excurrit in hac vasta civitate, ad quam sine numero confluunt afflicti, hanc operationem in arteria adeo ingenti nullus (quantum noverim) chirurgorum instituit.” Ruish, Vol. I. Observ. 2.

† “Posse vero ramulas minores se ita sensim dilatare, ut § XXXVIII. diximus, Clar. Du. Præses inde suspicatur, quia cum aliquando truncum arteriæ brachialis internum, graviter vulneratum, prædicta ratione supra vulnus ope filii circumdicti ligasset, intra triduum nullum in arteria juxta carpum posita, quæ a medicis explorari solet, pulsus sentire aut percipere potuit; posthæc vero hanc arteriam, primo levissime micare, sensim vero sensimque penitus pulsare sensit.”



ed not in its trunk, but only in one of the two branches into which it divides at the elbow. Thus Cheffelden says, "I had always thought this wound was in the inferior Cubital (*i. e.* in the Ulnar) Artery, and thus the sudden reflux of the blood was accounted for, by the communication of the two Cubital Arteries in the palm of the hand, and thus satisfied, I enquired no farther ; though Mr. Sharp, even so long ago as when he was my apprentice, told me that the wound was in the trunk, in the Humeral Artery itself, as indeed it is." p. 457. And yet the celebrated Dr. William Hunter, notwithstanding this affirmation of Cheffelden, lays it down in the most formal, positive manner, in the shape of a practical rule or inference, we know not what to call it, marked xv. "That though the Brachial Artery in most people divides into its two branches a little below the part where we commonly bleed ; yet perhaps it will be found, that the aneurism happens oftener to one of the branches, than to the trunk of that artery, because these often lie nearer the skin, and are thereby more exposed to injury." p. 353.

This has nothing in it of the usual correctness of Dr. Hunter ; for in point of fact it is wrong ; the branches do not lie nearer to the skin, they are buried deep under the bellies of the pronators and flexors of the arm, and any one may know this, whoever in his life has tied up an arm for bleeding, where he must have observed the strong beating of the artery only where it was entire, running in one trunk under the Median Basilic Vein. And his reasoning is farther wrong than his assertion ; for if in most people the artery divides a little below the place where we bleed, it matters little whether below that point the two branches be superficial or deep, the aneurism cannot happen "oftener to one of the branches than to the trunk."

I feel myself entitled to set up, at the conclusion of this discourse, a rule, the very reverse of that with which it began, and to say that, after these proofs, the questions about inoculations may be blotted out altogether ; that wounds of the Axillary Artery, like wounds of the Femoral Artery, are often dangerous from

bleeding, but never fatal from the want of inosculation ; that we should tie the greatest arteries confidently wherever they are wounded without the trunk of the body, and that we should tie the arteries as boldly at the groin or in the axilla as in the lesser branches going down the thigh or arm. Accidents undoubtedly (as we are in all our operations at the mercy of accident) may prevent our achieving a cure ; a limb bruised with a waggon wheel, or wounded with a great ball, cannot be so easily saved, as when the artery alone is wounded by the stab of a knife or sword : Yet, although the accidents and dangers of gangrene were multiplied tenfold, this common way of cutting off the thigh, or amputating the arm at the shoulder joint, is bad doctrine, and cruel practice.

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## DISCOURSE III.

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### OF THE CONDITION OF A WOUNDED ARTERY ;

OF THE NATURE OF THE TUMOR WHICH RISES OVER THE WOUND  
OF A GREAT ARTERY ; AND OF THE WAY OF OPERATING IN  
THOSE RECENT ANEURISMS.

I AM now to explain to you the condition of a wounded artery ; not where it is touched in a wide and open wound, for there the artery bleeds profusely, and either it is presently tied, or the patient dies. But I am to explain to you the state of a greater artery, wounded deep among the muscular flesh, struck perhaps with the point of a sword or knife, or cut across by a ball, for then the blood escapes difficultly through the narrow wound ; there is little outward bleeding ; the artery bleeds chiefly within, and by that inward bleeding forms a sudden tumor of the most dangerous kind, requiring a sudden operation almost as if the artery were still open pouring out its blood : The artery, indeed, is still open, is still pouring out its blood, and nothing resists it but the skin ; if that slender barrier give way, the patient dies with one gush of blood.

When a man is wounded in any great artery, the blood flows in so full a stream, that in a moment he faints, falls down, and it is then only that the bystanders can command the blood, by gathering up any cloths that are at hand, and cramming them into the wound in a confused and ineffectual way, till at last the surgeon comes and stops the blood. Now the surgeon at the first sight of such a wound is himself alarmed, he fears that it is the great artery of the limb ; he is unwilling to cut up the arm or

high, and to undertake the tying up of the great artery without some farther help and advice ; he throws off the loose cloths or bandages ; lays a fair and very firm compress upon the wound ; rolls it with a steady bandage, and, leaving a tourniquet about the limb, informs the friends of all his fears, and of all the expected difficulties and dangers of such a case, and desires that some consulting surgeons may be called. The consultation proceeds at first upon these points, the place of the limb that is wounded, the shape of the weapon, the deepness of the wound ; but the surgeons do not in general unbind the wound, at least, if it be a deep and punctured wound, till the skin has adhered, till the aneurismal tumor is formed, and then being able to undo the dressings without any danger of farther bleeding, they have all the case before them.

The tumor rises higher and higher every day ; at every visit they see a change. The tumor is large, hard, circumscribed, and beating very strongly ; the skin over it begins to inflame, the wound of the knife threatens to open again, the whole limb is feeble and cold ; the surface of the tumor is livid, and in a few days the beating, from such an artery as the Femoral Artery, is most alarming, and to the patient very awful ; he spreads his hand broad over the tumor, feels its beating, like the heart in its strongest palpitations ; beating against the side. He is laid with tourniquets round the limb ; he sees by these precautions, and he feels, as it were, that, if the tumor burst during the night, he must lose his life with one gush of blood. Lying in this anxious condition, he is watched from hour to hour, till the time appointed for the operation arrives : and it is then only, (however great the surgeon's fears about this operation), that the patient is in any degree safe.

It is not always that the surgeon has his mind so settled concerning the tying of these great arteries, as to do his operation on the very moment of the wound ; and yet he may as well do so ; for, whether he determine by his reasoning that it is safe, or dangerous, to tie the great artery of the limb, still the circumstances of the wound are the same ; and the artery, whether it be the

great artery, or some secondary branch, whether punctured or fairly cut across, is lost to that limb ; and since the wound itself of a great artery cannot heal, its cavity must be closed. This alone should determine us how to move in this critical moment ; and I am clear that the surgeon, when he is called in good time to such a wound, should clap the point of his finger upon the wounded artery, or make his assistant hold the artery ; cut the wound so far open, as to see the artery fairly ; draw it out if it be cut across, and have shrunk among the flesh ; or tie it like the artery of the arm in aneurism, by passing ligatures under it, if this greater artery be punctured only with the knife or sword, as that of the arm often is with the lancet.

But in nine of ten cases, the surgeon wants courage to do this, as he thinks, hopeless operation, upon the spot. The case falls to be determined by slow and hesitating consultations, the surgeons debate whether it be the trunk of the artery that is wounded ; whether, if it be the trunk, it should be tied ; doubting, perhaps, whether the limb should not rather be cut off. Thus the outward wound is allowed to heal, the inward bleeding goes on, and the regular aneurismal bag is formed. There are certain circumstances, in which it is even our duty to bring the case into this shape ; for example, if there be a wound of the great arteries in the back of the hip, in the groin, in the armpit, we cannot command the blood easily ; we are not sure of clapping our finger down upon the artery, at the very point where it is wounded ; we are afraid lest the patient should die, (even after we have come to him), with one single gush of blood ; we therefore close the narrow wound, put its lips together, settle it with a very steady compress and bandage, and try to make the lips adhere, and then we have a fair aneurism, which we can look upon composedly ; we can reflect upon the course of the wound, and calculate which artery is most probably wounded ; for besides the main trunk there are other arteries in the armpit and the thigh, as the arteries of the scapula or the Arteria Profunda, which being wounded, will make aneurisms as large, though not so dangerous as those of



the Axillary or Femoral Arteries, and to be distinguished from them chiefly by the pulsations in the wrist or ankle, continuing strong\*.

The arterial trunks and all their greater branches in every part of the body lie under the fascia ; and seem to owe no less to the support of these fasciæ, than the muscles themselves. Over all the body the fascia is almost equally strong ; the skin and fascia, where the wound is secured with compresses, are pressed together and adhere ; the blood, by this accident, is always driven hard under the fascia, and is never diffused under the skin ; the skin merely covers the aneurismal tumor, while it is the tense fascia that gives form to the aneurism. The fascia, thus confining the blood, limits the size of the tumor, gives it a fair and circular form, is itself tense and firm, livid also by the colour of the contained blood ; shining and resplendent like the inner surface of the gizzard of a fowl, and the skin and fascia may be cut distinctly from each other, as freely as we cut the skin over a diseased breast without touching the hardened gland, or rather, (for a more close resemblance), as we draw our knife clean along the surface of a hernia, without touching the sac ; or as we cut the scrotum over the hydrocele without touching the vaginal coat.

Nor is the surface of an aneurismal bag very irregular, even upon its back part, for each muscle is involved in its own fascia, so that the fascia is also of tolerable strength within ; the internal processes of the fascia, and the condensation of the cellular substance, (as it is driven closer by the blood), set also some bounds to its extension within, so that the blood is no more diffused among the flesh, than under the skin ; but the circumstances of the tumor will vary infinitely according to the nature of the wound. I have seen the Femoral Artery cut fairly across with the knife ; there the wound, passing deeper than the artery, will allow of a greater bag, and the artery will pour out its blood behind, as well as before it. I have seen the Femoral Artery just touched

\* The pulsation may sometimes continue in the lower part of a limb, notwithstanding a wound of its main trunk, from the obliquity of the outward wound, as shall be explained presently.

with the point of a penknife and not transfixed, the wound not passing through the artery, no blood behind, but the aneurismal bag formed immediately beneath the fascia and skin, and the artery keeping its place among the muscles of the thigh; nothing of the artery but the wounded slit in it appearing, the muscles adhering firmly to the artery, and with a degree of inflammation, and thickening; the flat surface of the artery nitched in among the inflamed muscles, and the flat surfaces of the muscles themselves forming the back part of the tumor: and I have also seen the artery entirely cut across by the fractured ends of the thigh bone, so that the opposite ends of the artery hung together by a single tag, and the aneurismal bag, instead of being formed betwixt the fascia and the great muscles of the thigh, was formed betwixt the great muscles and the bone, so that the broad belly of the muscle named Vastus Internus, formed the chief surface of the sac. But, whatever be the form of the bag or the condition of the artery, let the surgeon be prepared to encounter difficulties, by trying to calculate how the parts may probably be connected with each other, whether under the fasciæ only, or under the muscles, whether pressed together by inflammation, or thickened by the driving and compression of the blood.

Thus the advantages from an aneurismal bag being formed before we are called, or by our own compresses healing the wound, are these; that we are not hurried all at once into the midst of a bloody operation; that we are somewhat easy about our patient's immediate safety, there being no danger of fatal bleeding, at least for a few days; that we have warning of every dangerous change by the alteration in the surface; that we have time to consult; to calculate which artery is wounded, and to settle all the steps as in any other operation, putting our tourniquets round the leg or thigh, or settling the compresses of the clavicle or groin, if the artery be wounded very high.

But it is equally plain, that though a recent aneurism is thus managed with more ease to the surgeon, and less loss of blood to the patient, than a large and open wound; yet an old aneurism,

suffered to grow for weeks or months, is attended with great danger ; for, if the artery be very great, as in the hip or thigh, the bag enlarges very rapidly ; all the parts are compressed and hurt, the blood is driven deeper and deeper among the muscular flesh, and at the same time that the soft parts are disordered, even the bone may be spoiled, which must render the operation ineffectual in saving the limb. The accumulation makes it more difficult to find the artery, presses it deeper every moment, and farther out of the reach of the surgeon ; the bag comes, in a few weeks, to hold six or seven pounds of blood, and this extension of surface, causes a greater suppuration, which (wherever the matter is, as in this case, contaminated with blood), is never kindly nor well disposed to heal.

Wherever we have it in our power to apply the tourniquet, and command the blood ; or, in other terms, wherever we have to deal only with a wound, or smaller aneurism of the arm or ham, or the lower part of the thigh, the operation is easy. But in the greater aneurisms of the armpit, haunch or groin, we must trust nothing to compression, and must do our operation with particular boldness and skill, otherwise we shall hardly save our patient, for in a very moment he is either saved or dead.

The rules belonging to this case of an aneurismal bag, holding some great artery, are chiefly these :

1. You are not to trust entirely to the compression which your assistant tries to make upon the groin, or below the clavicle ; for it is one matter to suppress the pulse in the lower part of a limb, and another to stop altogether the current of the blood ; but you are to look upon this as an open artery, and expect that the moment you cut the tumor, the blood will rush upon you with a terrifying violence : nor should you ever expect to clean the great cavity with sponges or cloths, for the artery will fill the cavity with blood, faster than you can throw it out, till the patient breathes his last. Instead of this, you draw your knife deliberately and fairly over the tumor, so as to lay it open. The skin being thus divided, the great livid bag of the aneurism surrounds-

ed with its strong fascia, rises into view. Next push your lancet into the bag, and then do all that remains in your operation with great boldness ; run your bistoury upwards and downwards so as to slit up the tumor quickly ; plunge your hand suddenly down towards the bottom ; turn out the great clots of blood with your hand and fingers, till having reached the bottom entirely, you begin to feel the warm jet of blood, and directed by that, clap your finger upon the wounded point of the artery, as it has but a point, your finger will cover it fairly, and your feeling the beating of the artery assures you that all is now safe.

Now the bleeding, confusion, and fainting are over in a moment ; the operator breathes, and the assistants are composed ; and all the operation goes on easily and safely. The artery is effectually commanded by this pressure with the finger ; but the first movement in such an operation, *viz.* the act of stopping the blood is all boldness, and nothing of caution ; no danger is to be apprehended, but that of suffering your patient to lose blood.

2. Being now composed, you take time to arrange every thing for the next step of your operation, you feel the beating of the artery with the point of your finger, perhaps you lift the point of your finger for a moment, to discover whether the pressure of your assistants, at the groin or clavicle, commands the artery : If so, you lift your finger, and examine round the artery ; if not, you keep your finger steady, make the assistants clean the bag round the artery ; then, if the artery lies fair and free in the bottom of the cavity, you proceed to tie it ; but if not, you must dissect round the artery, until you set it free from other parts, and have it so insulated as that you may put your ligature easily under it ; unless indeed the recollection of some great trunk being near the wounded artery (as of the Profunda, when you are tying the femoral artery) should stop you ; but yet the nearness of any great artery or nerve, is an argument as strong against your diving with the needle to catch the wounded artery, as against your dissecting with the knife. Since therefore the dissection is done with your eyes open, and you can see and feel before the point of your knife ;

rather dissect, or sometimes tear the artery naked with the point of your fingers, tying its open mouth, if cut across, as fairly as in an amputated stump; or, if it be touched only with the point of a knife or sword, put two ligatures round it, one above and one below the wound, and put them neatly and fairly round the artery, as in tying for aneurism of the arm, and cut it across betwixt the two ligatures.

3. In regard to the size and form of your ligatures, do not allow in yourself the slavish and absurd fear of cutting arteries across with them. It makes surgeons use ligatures in amputation, such as are often ineffectual; and in aneurisms of the thigh or shoulder, they use such tapes as it would be impossible to draw tight even round the aorta, though that could become the subject of their operation; the circle of the knot made by such a ligature is often wider than the diameter of the arterial trunk. Surgeons have complained that they could not draw their tapes tight enough round the femoral artery, even with the whole strength of their hands.

Let your ligature, then, be made of three or four threads well waxed, tied not with the surgeon's knot, but with one single knot moderately drawn, secured with a second single knot, the threads left hanging from one corner of the wound.

4. It can hardly be necessary to advise that, after such operations upon the Humeral or Femoral artery, tourniquets be still kept round the limb, to guard against those accidents, which have so often happened, and will we fear continue to happen, in the hands of the most famous surgeon.

But if it chance that the parts are so massed with inflammation, so disordered by the driving of the blood in old aneurisms; or perhaps the parts so hurt, as to be almost in a state of gangrene; if the surgeon cannot by any means get a fair view of the artery, and that his patient be losing blood, pouring from some great trunk, then must he strike his needle at random, in order to come at his object the nearest way; and the only satisfaction that he can have, or the only proof of his having tied the artery at all,



will be only the sudden stopping of the blood, when he draws his ligature. In circumstances like these, the greatest surgeons, (even Mr. Pott himself), have been accused of having missed the artery; but at all events since it is irregularly tied, or perhaps not at all, the attendants, that are appointed, must be skilful, and must be interested; both friends and surgeons should watch over the patient's life most faithfully; for successive bleedings will happen, often from some sudden turn, or unwary motion in his bed during the night; and he is lost or saved in a moment of time\*.

One thing I am chiefly afraid of, that this description may seem overcharged; that I may appear to have exaggerated the difficulties of an operation like this; that it may be thought that an accident requiring all these precautions, and this plunging down of the hand, can hardly occur. Therefore I state to you the following case, and I dare say, after having considered it, you will perceive that it needs no apology; but that, as it is new and interesting, it deserves its place.

A poor man, who was by trade a leech-catcher, fell as he was stepping out of a boat, and the long and pointed scissors which are used in his business being in his pocket, pierced his hip exactly over the place of the sciatic notch, where the great Iliac Artery

\* Mr. Hume says, in reporting one of Mr. Pott's observations, that the depth of the incision made it very difficult for any one but the operator, and those immediately around him, to see what was included in the ligature; and at the time the Popliteal Artery was *supposed* to be secured by it. The insinuation is as direct, as good manners will allow; but it is more than an insinuation; for, in an account of the same case, published some years since, Mr. Hume says, "No doubt was made at the time, of its being any thing but the artery that he had tied." Next, Mr. Hume proceeds to reason upon it in such a form, as to imply a direct affirmation, that the artery was not tied. Whether the aneurism was in a branch, or whether it was in the trunk of the artery, the pulsation should not have been felt in the tumor, if the Popliteal Artery was rendered impervious: But however we shall choose to explain it, the fact is, that, by the second day after the operation, the artery was again throwing its blood into the aneurismal bag, so that a strong pulsation was felt; and the tumor swelled so rapidly, that Mr. Pott cut off the limb.

comes out from the pelvis. The artery was struck with the point of the scissars, it bled furiously, the patient fainted : and in so narrow and deep a wound, the surgeon, when he came, found little difficulty in stopping it up, and less difficulty still in making it heal. The outward wound was cured ; the great tumor soon formed ; and the man travelled up from the North Country where the accident had befallen him, and in six weeks after arrived in our hospital here with a prodigious tumor of the hip, his thigh rigidly contracted, the ham bended, the whole leg shrunk, cold and useless, as if it had been an aneurism rather of the artery on the fore part of the thigh.

The tumor was of a prodigious size, and by that very circumstance of its being one of the greatest aneurisms, it lost all the characteristics of aneurism, especially there was no pulsation, no retrocession of the blood when the tumor was pressed upon ; there was nothing peculiar except this, that the great and sudden distention was the cause of great pain ; and from the continual pain, lameness, and his hopes of a cure, he was ready to submit to any thing, beseeching us to operate.

There was little doubt of its being a great aneurism, but there was a possibility of its being a vast abscess ; and it was resolved, in consultation, that he should be carried into the operation room ; that a small incision should be made ; that the skin being cut, the bag itself should be just touched with the point of a lancet ; and if found to contain matter, should be fully opened ; but if blood, that it was then to be considered as an aneurism of so particular a kind, as to entitle us to call for a full consultation.

I made an incision two inches and a half in length ; the great fascia in the hip, blue, and very strong, formed the coat of the tumor, and under that were seen the big fibres of the great Gluteus Muscle. The knife was struck into it, and large clots of very firm black blood rolled out by the tension of the tumor, which began to emit the clots in this way the moment that it was opened at one point. There was one thing farther desira-

ble before we put the patient to bed, that we should understand the case so far as to be able to report to the consultation, whether the artery was absolutely open, and whether it was the great artery of the hip. I continued therefore (knowing that the opening I had made could be covered with the point of the thumb) to pull out a few more clots of blood, till the warm and florid blood began to flow ; I then pushed in a tent-like compress into the small wound of the tumor, (*viz.* of the fascia,) laid a broad compress over the outward wound, and put the patient to bed with one of the pupils holding his hand upon the hip.

This was done at one o'clock, and at four the consultation met, and the operation was performed. And in my notes, I find two steps of the operation chiefly marked : First, That upon our opening the tumor fully with an incision of eight inches long, and turning out the great clots, the blood was thrown out with a whirling noise, and with such impetus, that the assistants were covered with it, and in a moment twenty hands were about the tumor, and the bag was filled with sponges, and cloths of all kinds, which had no better effect than the cloths, which, in any accident, the friends in great confusion wrap round a wounded arm ; for though the blood was not thrown in a full stream, nor in jets, it was seen rising above the edges of the incision ; it floated by the sides of the cloths, which were pressed down by the hands of the assistants. But we knew by a more alarming sign that the artery was throwing out blood ; for the man who was at first lying not flat, but supporting himself on his elbows, fell down, his arms fell lifeless, and without pulse, over the side of the table, his head hung down and was livid, he uttered two or three heavy groans, and we believed him dead.

Secondly, Seeing in this critical moment that, if he was to be saved, it could be only by a sudden stroke, I ran the bistoury upwards and downwards, and at once made my incision two feet in length : I thrust my hand down to the bottom of the tumor, turned out the great sponge which was over the artery, felt the warm jet of blood, and placed the point of my finger upon the

mouth of the artery ; then I felt distinctly its pulse, and then only was I assured that the man was still alive. The assistants laid aside the edges of this prodigious bag, and sought out the several smaller sponges which had been thrust in, and the bag being deliberately cleaned, and its edges held aside, I kept the fore finger of my left hand steady upon the artery, passed one of the largest needles round under my fore finger, so as to furround the artery : one of my friends tied the ligature, and then upon lifting the point of my finger, it was distinctly seen, that it was the Posterior Iliac Artery,—that the artery had been cut fairly across, and had bled with open mouth—that it was cut and tied exactly where it turns over the bone : and although the extremities were cold, the face of a leaden colour, and the man had ceased to groan, and lay as dead ; though the faint pulsation could not be felt through the skin, in any part of the body ; we saw the artery beating so strongly, whenever I lifted my finger, that we were assured of our patient's safety ; however, he was so low that, after laying down the sides of the sac, and putting bandages round his body to keep all firm, we were obliged to have a bed brought in, and having given him some cordials we left him to sleep in the great operation room, attended by the pupils and by nurses.

He was cured of this great wound in less than seven months, although his cure was protracted by the foul suppuration of such a bag, and by the exfoliation of the Ilium and Sacrum, which spoiled, not so much from their having been laid bare by the last sudden stroke of the knife, as by the aneurismal blood having lain upon them ; the exfoliations were very large, and the Sacrum especially continued exfoliating to the very day on which the wound closed.

I do not know whether this man be recovered entirely, for he left the house lame, from the contractions of the hip and ham, and walking by the help of a stick ; but however, he thought himself fit to undertake his profession, and went to England with that design.\*

\* Dr. Farquharson, who succeeded me in the charge of the

This case will impress the directions already given upon your mind, and is singular and well worthy of a place, since this was one of the largest aneurisms ever heard of, containing not less than eight pounds of blood. It is an instance of one of the least probable of all wounds, *viz.* a small sharp point touching one of the deepest arteries, and one of the largest; and wounding it at the very point, where it comes out from the trunk of the body; and where it cannot be compressed; for though my friend Doctor Farquharson tried to make some impression upon the descending aorta, by pressing down his fist into the belly, so as almost to touch the spine, still there was a deluge of blood upon cutting up the tumor, and the artery beat strongly under my finger.

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But there is a thing more distressing to the surgeon, than all the difficulties of the operation, *viz.* That the artery, after it seems to be secured, often gives way; so that, as I have observed already, such cases are dangerous, not so much by nature failing in her business of supporting the circulation through the anastomosing arteries, as by the surgeon's not being able on his part to secure the greater arterial trunks; hardly any have died of gangrene; very many have died from the loss of blood: It was from frequent disappointments that Mr. Hunter was induced to change his operation; he tied the Popliteal Aneurism, not in the ham, but in the thigh; thinking to find the artery less diseased at that higher point. It was under the smart of frequent disappointments, that he thought of this new operation, and I fear, his disappointments were not fewer after this change; for in glancing our eye over the list of cases, we find, that it is by hæmorrhagy that patients have generally died, some after the common operation, some after the operation in Hunter's way, some have died

Hospital, has just informed me, of this man having called upon him after his return from England, walking stoutly, and in good health.



early, some late, some even have died of bleeding, so late as the twentieth day.

In one of Mr. Hunter's operations, the artery gave way, even so late as the 26th day ; for this fatal bleeding began first upon the 14th day ; returned, and was suppressed by compresses upon the 19th day ; burst out upon the 20th day ; and bursting out upon the 20th day a second time, Mr. Hunter was forced to cut up the thigh on its fore part, and tie the artery anew : But still the artery was not secured, on the 23d day it was still bleeding, and on the 26th day it bled violently, till the man fell low, fainted, became delirious and expired.

Mr. Birche's patient died on the 14th day ; he went in the evening to see him, but he had just expired, " the limb was still warm, he lifted the dressings, and he found a small stream of fresh arterial blood issuing from the wound : " Heister, and Hunter, and Pott, and the celebrated Sabbatier, and Mr. Duschamps, and Mr. Deseault, all of them have lost patients by the bursting of the artery, and after death injections, thrown into the Iliac Artery, have run freely out by the wound in the thigh. All these patients have died of bleeding, and all of them have lived long enough to prove that the limb was safe.—From these accidents, we are now certain, that there is either something peculiar in the nature of a great artery, so that it cannot easily be subdued ; or that there is something wrong in our manner of operating, or that the confusion of these operations is such, that even the best surgeons are accused of having failed : Mr. Pott himself, was only *supposed* to have tied the artery of the thigh. Such accidents happening thus in the hands of the most famous surgeons, should be remembered in vindication of those to whom in future the like misfortunes may happen : should they not also be a strong motive for our striving to find out by future observations what may be the cause ?

We are not yet arrived at such a degree of knowledge, of the structure, and functions of arteries, as to understand fully the cause of this insecurity ; but we cannot be without a desire to under-

stand it. I should put down here some notions on this subject more freely, if I thought them in any degree proved ; but, however, the few that I shall now propose, leads us to precautions which have this advantage at least, that they do no ill.

The most obvious reasons then, of this insecurity, are these, which they will best understand who are most employed in dissection.—We observe, towards the decline of life, a change on the conditions of the whole arterial system plainly unfavourable to our operations. We find the arteries less pliant, sometimes contracted, sometimes enlarged, sometimes ossified, their coats always thick, and separating from each other upon the slightest touch. They are brittle and fragile, and have a crisped feeling, they have lost all their strength, our injections burst them, and our ligatures cut them across ; in short, our anatomical injections go well or surely, only in the smallest arteries, or in the limber and pliant arteries of a younger subject : In subjects beyond the prime of life, they often fail. The anatomist knows by the first touch of the artery, when it is hard, that he needs not fix his tube there ; and the surgeon often foresees also, by the first touch of his finger in performing his operations, those terrible hæmorrhages, and burstings of the arteries, which occasion so much anxiety and distress. In subjects beyond the age of forty, we have more reason to be apprehensive, though we often see these changes in the arterial system, this tendency to dissolution, or at least to disease, very early in life\*.

Thus, by the age of the subject, the arteries may want a disposition to inflame ; or by the thickness of the arterial coats they are not pliant, so that they cannot be put in contact ; and, wheth-

\* Petit cut off the thigh of a gentleman, on account of a compound fracture, by which he had been confined eighteen months to bed, he found the Femoral artery so ossified, that his tourniquet had no effect upon it ; his ligatures did not draw its sides together, there was no likelihood that caustics or cauteries, or any thing but continued compression could have any effect, and he was obliged to invent a machine having two plates, which, by the working of a screw, pressed continually upon the broad face of the stump.

er they have or have not the disposition to inflame, they have not an opportunity of adhering—or by the greater caliber of such an artery, its circle being wide in its natural condition, is puckered and unequal when it is tied ; so that by this also it cannot so well adhere ; and I am sure that the tapes, which have been used for tying so great an artery, have often, when tied with the surgeon's knot, been larger in their diameters than the arterial trunk itself ; and Mr. Dufchamps actually tells us of a surgeon, who could not draw his ligature so as to stop the artery, and was obliged on that account alone to cut off the limb.

Perhaps it is from natural and unavoidable causes like these, without seeking for any more curious explanations, that we are to explain the frequent burstings of great arteries, as in the thigh or ham. We do not know all the causes, but those which we do know, are such as should make us anxious and watchful in no common degree, with a continual and minute attention to every circumstance in the tying of the artery.

Ulceration of the artery is the great, and almost the sole cause of its bursting ; for always the artery must be regarded as a part of the living body, subject to the same affection with the other soft parts. To enumerate a few of the causes of this ulceration of the artery, will suggest precautions very different from those which have hitherto been practised ; and will, perhaps, induce surgeons to revive the oldest method of all, *viz.* that of tying the artery with two ligatures, and cutting across in the space betwixt them.

1. When a ligature is used too large for the occasion, the ligature being stiff, firmly waxed, and unpliant, hardly compresses the artery even at the first, and no sooner do the soft parts begin to die under the ligature, than the loop of it is found slack, the artery is not destroyed, nor its canal obliterated ; the blood runs along, and issues, as at first, from the wound of the artery.

2. The ligature, in place of being laid under the artery, after a fair and clean dissection of it, is pushed through among the muscles and cellular substance, with a large and sharp needle ; in or-

der to avoid the main artery itself, the needle is passed at some distance from it ; the ligature is drawn firm, and the artery for the time compressed ; but, in a few days, the soft parts under the ligature fade, and it loses all command of the artery.

3. When, in this rude way, the great nerve is included along with the artery, the danger is not of that kind, which surgeons have usually apprehended ; we need not be afraid of convulsions and locked jaws ; the tying of any artery is safe in this respect ; but the danger is quite of another kind ; it relates not to the nerve itself, but to the artery which is included along with it in the same ligature ; for the nerve is an indestructible part ; its firm coats defend it from the ligature ; it is not compressed like the artery ; it is not killed and mortified by the stricture ; it never gives way to the ligature, and the ligature keeping its hold so long, is sure to produce dismal consequences ; for this is the natural progress of the artery tied with a ligature ; that it is strangled by the ligature ; the part thus strangled, is soon to be cut off ; but while the part of the artery, betwixt the two ligatures, is thus cut off, the part round which the ligature is directly applied, is only inflamed ; the sides of the arterial canal adhere ; the canal of the artery is closed, before the ligature falls off. But when the nerve also is included in the ligature, the ligature holds its place ; it keeps firm, even after the artery is cut across ; and, by keeping its hold too long upon the artery, the process of inflammation is continued ; the ulceration mounts upwards along the artery ; and when it arrives at that point, where the channel of the artery is still open, and when the ulceration weakens the coats of the artery, it bursts ; and it sometimes bursts from the progress of the ulceration, after the ligature has been drawn away.

4. On this, as on many occasions, the surgeon forgetting that he is operating upon the living—forgetting that it is not the firmness of his ligature (which must soon be pulled away) that secures the artery, but that process of adhesion of the sides of the arterial tube which obliterates its canal—The surgeon, forget-

ting that the artery is a part of the living body, and that his ligature operates only by conducing to a certain natural process, is anxious about nothing but the mechanical firmness of his ligatures. In Hernia, the surgeon, in place of trusting the reunion of the intestines to the natural process of adhesion, trusts to nothing but enteroraphies, sews the guts round and round with a double row of stitches, which can produce nothing but gangrene ; and tying arteries, he trusts to nothing but ligatures, and uses four ligatures, which can have no other effect than causing ulceration and bursting of the artery.

*First*, when two ligatures are applied, there is some chance of those ligatures causing a mortification of the intercepted part of the artery, and an adhesion of those points round which the ligature is applied, there is a chance that the ligatures will come away at the time when the two ends of the artery close ; that the inflammation will cease, and the ends of the artery shrink among the surrounding flesh, and mix with granulations of the healing wound.

*Secondly*, When the artery is tied with two such ligatures, and then relays of ligatures, *i. e.* ligatures to be drawn tight upon the occasion of any hæmorrhagy, are laid loose under the artery, an inch above, and an inch below each of the ligatures—this attempt at security is the real cause of danger ; with this operation, it is almost impossible that the artery, however safe at first, should continue secure. For, when the first ligatures are performing this office of obliterating the artery, and cutting it across, the occasional ligatures are operating their worst effects : They are not tight about the artery ; they do not obliterate it, but they irritate the coats of the artery ; they keep it insulated ; they infallibly cause ulceration ;—and so insidiously does this dangerous ulceration creep along the artery, that the blood often bursts out long after the ligatures are removed. Nor can you be ever assured of your patient's safety to the 20th or 30th day ; nor indeed till the wound is almost healed :—While there is a suppurating



cavity in which the artery may lie ulcerating, you never are securely safe.

From this theory, I am persuaded that the usual practices for securing an artery, are the chief causes of danger. That the more mechanical ingenuity the surgeon exerts, the more is he exposed to the most distressing accidents. Every attempt at mechanical security, is likely to produce ulceration of the arterial tube ; and the stripping of the artery of much cellular substance ; the separating the arterial tube from the bed of cellular substance in which it lies, and from the vessels by which it should be nourished ; the laying pieces of cork under the ligature ; the using pieces of tin-plate ; the laying pieces of bend-leather under the artery, and the using machines like that of Mr. Duschamps,\* for securing the great arteries ; and, most of all, the laying a succession of ligatures under the artery, are sure to produce ulceration and secondary hæmorrhagy.

*Thirdly*, When we consider the difference in the security of an artery tied in aneurism, and tied in amputation, the one the most secure, the other the most uncertain operation in surgery, we cannot but suspect that the cause of insecurity, in aneurism, is merely from the insulated condition of the artery : for, from the great size of an aneurismal sac, from the quantity of blood effused round the wounded artery, and from the destruction of the cellular substance, it is separated from all those vascular connections which should keep it alive and in health, and the operations usually practised upon the wounded artery serve but to insulate it the more. When those things are considered, perhaps, the oldest operation of all will be found the best, *viz.* to find out the artery, and tie it with two ligatures ; cut it across betwixt them, and allow it to shrink, and bury itself among the surrounding flesh.

It is surely a point of the very first importance, to have the wounded artery sooner buried in granulations and in sound flesh ; for, though the healing of an artery depends always in part upon

\* Vid. Fourcroy.

its own lively disposition to adhere, yet it must depend also in some degree on the support of surrounding parts. Bleeding from a tied artery seldom comes on till the fourth or fifth day ; and if we could here, as in other great operations, lay the skin down and make it adhere before the sixth, or before the twelfth, or even before the 26th day, (as my late observations explain to you,) we should have it all sound before the usual period of bleeding ; but the surface is often large, the suppuration bad, the artery lies exposed, and may be dilated, or it must be eroded by the foul pus. Birche says, it was where the great artery of the thigh seemed to have ulcerated, that his injection ran out. Hume seems to attribute the death of his friend's patients to great suppuration, formed round the bed of the artery ; and certain it is, that Hunter succeeded better, when in some cases he closed up the thigh immediately with stitches ; for, in one case he procured almost an immediate adhesion of the wound, and in a few weeks a perfect cure. —Parée, Guy de Chauliac, and all the older surgeons, knew well the importance of surrounding and supporting an artery, and burying it quickly under the granulations. The Arabians, in their operations for aneurism, first tied their ligatures, and then cut the artery across, so that either end of the artery shrunk (surrounded by its own ligature) in among the sound flesh, and was no more seen. But, independently of all authority, the reason of the thing instructs us not to keep our wounded artery, as some choose to do, open, that they may see it and tie it when it bursts out, but to bury it so among the rising flesh that it may never be seen, and that in a few days it may be safe from bursting.

After all that can be said or done in explaining this bursting of arteries, from disease, this strong indelible impression must dwell upon our minds, that there must be some imperfection in our way of operating ; or, not to mince the matter, there must be something absolutely wrong in our operation. Some cases are so managed, that one surgeon dare say of another, that it was supposed that the artery was tied ; and can use this plain expres-

sion after the dissection of the limb. But there is this better reason still, for saying that there is something radically wrong in this operation, for in all our other operations with the needle we succeed. What then can the difference be, betwixt this tying of the Femoral Artery in Aneurism, that it is so full of uncertainty and imminent danger ; and the tying of the same artery in amputation, where the surgeon thinks the death of one patient by hæmorrhage a flagrant disgrace ? Or, why is it that, although in an amputation of the thigh, we tie the Femoral Artery itself ; though we tie also the Profunda, or four or five of its greatest branches : though the stump often continues open ; though the arteries are unsupported ; though a great suppuration, and often a very acrid one, ensues ; and although the arteries continue in this dangerous condition for fifteen or twenty days ; yet our tyings seldom give way ! I fear that the difference is no other than this, that in amputation we have our tourniquet about the limb ; we look upon the broad surface of the stump ; we see the naked arteries, draw them out fairly from among the flesh, tie them steadily and deliberately with a small ligature ; and whatever afterwards befalls such a stump, if it do not fall into absolute gangrene, or something near it, the arteries are secure : while, in the operation for any great aneurism, we sometimes have no tourniquet ; the compression does not stop the blood ; the patient faints before half our business of cleaning the sac is over ; or the parts are so massed with inflammation, that the artery is never either well seen or securely tied ; the patient is losing blood during every moment of this seeking for the artery ; at last he faints, and the surgeon in great alarm strikes his needle among the flesh and suppresses the bleeding for the time ; and thus it is, that in the end the case terminates so, that it is said, “ No one doubted at the time, that he had tied the Femoral Artery ;” while it is plain that he had not, from the event of the case. In this state of the business, then, we are hardly entitled to talk about diseased states of the arteries, which after all should be as frequent in amputation

as in aneurism. We had best lay down a resolution of running all risks, in cutting new arteries, rather than not dissect the artery clean. Let us dissect it clean, and then tie it as fairly as in an amputation of the thigh ; and if this really fail, then let us return to our experiments and speculations, and endeavour to find out the cause.

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## DISCOURSE IV.

### OF THE BLEEDINGS FROM THE SMALLER ARTERIES;

WITH SHORT HISTORIES OF THE OPINIONS CONCERNING THE  
STOPPING OF HÆMORRHAGY.

**B**Y the wounds of the smaller arteries, I mean those of arteries of the second order, as of arteries in the fore arm or leg ; not so large as to produce great and dangerous aneurisms ; but still of such importance, as sometimes to occasion the patient's bleeding to death.

Sometimes the patient is bleeding from a broad and open wound, and falls down with the loss of blood ; he is for the present time saved by fainting, but by repeated hæmorrhages his constitution suffers, or he even bleeds to death ; and very often, such successive bleedings from a small artery, or too often the want of skill in the surgeon, are here, as in the greater aneurisms, the sole reason for cutting off the limb. Sometimes the artery is wounded obliquely ; and the surgeon, never able to see the real place of the wound, attempts some confused or irregular operations, till, the patient losing blood, from day to day, grows languid and low, and after some sudden return of the hæmorrhagy, faints and expires.

Sometimes also the arteries are wounded deep among the muscles ; and there the blood corrupting the muscular flesh, or even spoiling the bones, is the occasion (after long suffering) of the patient's losing often his limb, and sometimes his life, although he should even escape all present dangers from the immediate loss of blood.

Under these, as the chief heads of my discourse, I shall explain



to you all that remains of this most interesting subject. For, whether I consider the suddenness with which these embarrassing accidents overtake the young surgeon; or the frequency of the accidents themselves; or the present or the remote consequences of such a wound; or the strange things that we read every day, of wounded arteries managed in a trifling, undecided way; of patients dying, or losing their limbs, even from wounds of the Radial Artery at the wrist; of surgeons unprepared, uncertain what they should do, sometimes diving clumsily with their needle among the flesh, sometimes thrusting a sponge into the wound, sometimes laying clumsy compresses upon the artery, with little better skill, and no better success than the friends could do; and worse than all, of surgeons exposing themselves, by holding consultations, to determine what next to do, or whether to cut off the limb;—I cannot but think this subject very important: And as it is important, I believe it will be well to explain to you first of all, the only thing which stands to this subject in the relation of a general doctrine, viz. the opinions of authors, concerning the various ways in which bleeding arteries are closed, (whether by the formation of a clot, or whether by the retraction of their open mouths, shrinking among the flesh); for upon this history of opinions there follows, in most natural order, a short history of the means that have been used for securing arteries, as styptics, compression, sponges, and the needle: But yet on this, as on many occasions, it is really the practice that suggests the doctrine, which then assumes a most imposing appearance, and seems to be itself the root of all the improvements in practice\*.

\* The justly celebrated Mr. White relates the consequences of bleeding from the Radial Artery, in the following terms. “The arteries of the wrist, having been cut, had been twice taken up by Mr. ———, a surgeon well accustomed to the operation; and Bovista and many other things had been tried. After each of these methods, the hæmorrhagy stopped for a few hours, and then frequently burst out again; especially upon the accession of a hot fit, to which he was now very liable. On the 7th day, I was called in consultation with Mr. Allan, to take off the arm: we found his hand and arm swelled to three times its natural size, from the frequent use of the tourniquet; which had been under a necessity

Mr. Petit was the first who called the public attention to a point of practice, which was of particular importance, at a time when the practice of tying arteries was not fully established, when surgeons still had their fears, and were still talking about convulsions, and the yielding of the ligature, debating hotly the danger of this operation.

Mr. Petit believed, that every bleeding artery was stopped, only by the formation of a clot ; astringents made clots, by coagulating the blood ; sponges, bovista, charpie, made clots by absorbing the moisture ; compresses made firmer clots, by shutting the mouths of the arteries, and by allowing time for the coagulation of the blood ; and even the tying of arteries was useful chiefly by forming a clot, but less secure, since, whenever the ligature came off from the artery, the clot was loosened, when often there was a slighter bleeding, from blood passing by the side of the clot, and sometimes there was a full hæmorrhagy, from the clot being driven forwards, and at last expelled by the blood. In a tied artery, says Petit, we have a conical clot ; in an artery which has been compressed, (since the artery is flattened like the reed of a hautboy), we have a flattened clot : In arteries stopped by charpie or astringents, we have a clot formed, partly by the contraction of the mouth of the artery, partly by the effect of the dressing, so that such an artery is stopped by a sort of double clot, of which there is one part small and conical, which, like a plug or cork, fills the canal of the artery, and another adhering to the dressings, of a flattened form, lying like a lid or cover over the mouth of the artery, but so connected with the other, that the rude or early removal of the dressings, pulls out this cork-like clot.

The chief of Mr. Petit's observations, for proving the authenticity of being moved to different parts of the arm, on account of the excoriations it had occasioned. For the last 24 hours, it had been applied almost without intermission, from a dread of his bleeding to death, as he had lost a prodigious quantity of blood. After the dressings and clotted blood were removed, we could distinctly see the mouth of the vessel, throwing, *per saltus*, what I can scarcely call blood, as its colour could hardly be distinguished from linen."—WHITE'S CASES.

city of this doctrine, was this, that, in dissecting the thigh of a man who had died five days after amputation, he found in the great Femoral Artery a large and solid clot. This he presented to the Royal Academy of Sciences in great pomp : But I believe it were no difficult matter to prove, that this great academy of the great King of France, Louis Quatorze, was very easily satisfied with presents of this nature ; but, rather than speak this kind of language, I should choose to say, that such a proof does not prove his very dangerous doctrine. It is a fact, which every one would do well to admit easily, whether he do or do not like the doctrine : for it is not likely that the mouth of an artery shall be stopped up after amputation, without the blood being coagulated behind the ligature ; nor is it likely that the arteries should all lie dead for some days in a gangrened limb, without the blood also lying stagnant in these motionless arteries, and coagulating of course. We are not therefore surprised to find many proofs of coagula being formed in every artery of a gangrened limb, or in the chief arteries of an amputated stump, or in the artery which has been tied for aneurism ; nor are we surprised, on the other hand, if in many dissections no such clots are found. It is an accident plainly ; no surgeon depends entirely upon a matter of such chance as this ; no surgeon sacrifices a gangrened limb, without having some thoughts about its great arteries, nor is there any surgeon almost, who has not seen very dangerous bleedings, from imprudent scarifications of such a gangrene. Why then should Mr. Pouteau\* be at so much pains in denying accidents like these, seeing that such clots are both so likely to happen, and are really so well proved by Hunter, and others ; and seeing that the formation of such clots has so little to do with that doctrine which Petit wanted to establish, and which Mr. Pouteau wished so earnestly to refuse. The proving that clots are formed in arteries, is no proof that it is the clot only that closes such arteries ; but rather, that it is the closing of the artery that forms the clot. The next proof that Mr. Petit gives of his doctrine, is really very ludicrous ; for

\* Vid. Pouteau, page 306.

he next proceeds to settle the value of the various absorbents, by a long suite of experiments, which he conducted in the following manner :— “ Astringents and such substances, as usually are employed for staunching the blood of wounds, surely must do so, says Mr. Petit, chiefly, by absorbing that humidity, which lies between the vessels and the flesh\*.” Petit made all his astringents absorbents, chiefly that they might drink up the thinner parts of the blood, and so help to form for him good, stiff, solid clots : he puts lumps of mutton into tea cups, with a reasonable proportion of the following astringents : first of common bole, then of terra sigillata, which is a finer earth or bole, then of Paris plaster, then of flacked lime, then of various gums, then of gum-arabic, then of vitriol, then of salt, then of sugar, and last of all, of spider’s webs ; and observes, with most curious precision, the exact degree in which each of these useless, foolish things contracted, or hardened the lumps of mutton ; which experiments are still extant in excellent French, in the Acts of the Academy of Sciences, for the year 1732 ; a perfect burlesque upon such experiments, and such subjects : And towards the end of this most philosophical paper, Mr. Petit inserts this wise caution, which completes the joke. “ But all these astringents must of course absorb more humidity, and act in a more lively and perfect manner in the living body ; whose parts are always warm, and always ready to put themselves in motion, by the force of the *animal spirits*, which are continually flowing.”† But I should want all apology for this long account of Petit, and of his doctrine, if it were not that it is a dangerous doctrine, and had absolutely led Petit himself into great mistakes ; he persuaded himself that the ligature was hardly more secure than any common means of suppressing bleeding ; that it was only so far useful, as it ensured a firm and conical clot ; that if the ligature fell off before this clot was fully

\* Vid. Academ. des Sciences, Ann. 1732, page 321.

† Tous ces astringents doivent absorber plus d’humidité et agir plus efficacement, sur les parties d’un corps vivant, qui sont chaudes, et toujours prêtes à se mettre en contraction par les esprits animaux qui y coulent incessamment.

formed, and perfect in its office, the artery would bleed. He therefore preferred the use of a compress, to that of a ligature, even in securing the arteries of a great stump : And we find him boasting that, though this method, viz. of compression, is the oldest of all, he will give to it all the effects of novelty ; and since it is the most natural way, and the very means which should have presented itself, first of all, to the imagination of the surgeon, I will restore it, says Petit, and set it up above all other means ; as cauteries, astringents, sponges, or even the ligature itself\*.” There is not one of all these, says Petit, that is sufficient of itself ; we must use the compress, to assist even the ligature.

We have here a most curious example of a man’s genius and his good sense at variance with each other. His theory seduced him, his good sense would have kept him right ; we find him forcing himself, as it were, to say, “ I will use the compress in preference to the astringents, styptics, caustics, or even the ligature itself ; wherever it is possible for me to do so† ;” which is plainly acknowledging, that he would use that kind of uncertain operation, to which his theory inclined him, wherever he was not forced, by the immediate danger of the case, to return to some surer means of restraining the blood.

And in one particular case where, after amputation of the thigh, the great Femoral Artery had, by a sudden motion of the patient, given way, we find Mr. Petit so averse to the use of the needle, that he would not tie this artery a second time, he kept his patient for many days in a very unhappy and very dangerous condition ; attended by four young surgeons, who relieved each other every hour, continually pressing with the point of the finger upon the mouth of the artery ; till, at last, he got a machine made, a sort of clumsy, complicated tourniquet, which, by the help of two broad plates, kept up a firm compression upon the whole face of the stump.

\* Vid. Posthumous Works, page 164, Vol. III.

† Soit par rapport à l’usage exclusif que je lui donne, en rejetant celui des astringens, des styptiques, des caustiques, et de la ligature même, AUTANT QU’IL EST POSSIBLE.



If these practices, and the invention of such machines, are to be the best fruits of such doctrines, we should be careful how we receive the other doctrines which have followed this in a rapid succession.

Next comes Mr. Morand, who adds his little bit of a doctrine to Mr. Petit's, which, whether true or false, was framed upon a grander scale. "No doubt," says Mr. Morand, "Petit has explained vastly well how the clots stop bleeding,\* but these clots cannot be the worse for some help from the artery." I think I shall be able to give you a tolerable idea of what his confused notion was, in one single word: for, it was neither that contraction of the diameter of the artery, which has been since then so distinctly made out by Kirkland, White, and many of our best English surgeons; nor that retraction of the artery among the surrounding flesh, which has been so much insisted upon by Pouteau and other good authors; but an equivocal generation betwixt these two ideas floating confusedly in the man's mind. You have his notion all at once, when I tell you, that the word, by which he always expresses it, is the crisping up of the artery, "*par la crispation du tuyau*:" And he can tell no more about it, than that this cabaging of the artery assists the clot.

Next came Mr. Pouteau, whose experiments and reasoning approached indeed nearer the truth; but always a man reasons first, and makes his experiments after; and this is plainly the light in which his dissections are to be viewed.

"I have dissected a Femoral Artery, says Mr. Pouteau, three weeks after it had been tied in amputation; but in it I found nothing of Mr. Petit's clot; nothing to close or compress the artery, except merely the thickening of the surrounding cellular substance; for the ligature was loose about the artery. The canal of the artery was conical, for it grew narrow nearer to the ligature. Immediately under the ligature it was not obliterated but was much straitened: It was only below the ligature that it was entirely straitened, ending in a blind sac." This straitening

\* *Memoirs de la Société Royale des Sciences*, An. 1766, page 221.

of the arterial tube was accompanied, or rather, according to Mr. Pouteau, was caused by a thickening of the surrounding flesh : for the flesh which surrounded the straitened part of the artery, was a good deal gorged and swelled ; that, which lay immediately under the ligature, was in a state of gangrene ; the flesh again, which adhered about the mouth of the artery, where it ended in the blind sac, was of a cartilaginous hardness and much swelled. Of course, it was Mr. Pouteau's opinion, that it was the swelling of the surrounding cellular substance that compressed the artery and stopped the blood.

This, then, being the doctrine of Mr. Pouteau, his practice follows his doctrine reasonably enough : for, says Mr. Pouteau, " Let it be once proved that it is the swelling merely of the parts surrounding the artery that prevents the blood, it follows, of course, that the greater the bundle of flesh that is accumulated round the artery ; the more of the parts you include in your ligature, the greater the swelling must be, and the resistance to the irruption of the blood must be proportionably great\*.

Mr. Pouteau is cunning enough to show us only an arterial trunk tied coarsely with the needle, with much cellular substance surrounding the artery above the ligature, and some below ; and thus he takes his opportunity of insinuating his doctrine, by saying, " there was much cellular substance thickened above the ligature, and there was a like thickening of the cellular substance below ; and the artery was not obliterated at the point where the ligature was, but only its mouth was closed."

But what is to be said of those cases, where there is little cellular substance surrounding the artery above, and none below ; where the artery is drawn out with the tenaculum, and tied clean of all the surrounding flesh, and what would happen in this case, if the artery were not obliterated at the point, where the ligature compressed its coats ? This doctrine of Mr. Pouteau seems at

\* Mais s'il est une fois avéré que le gonflement des parties au dessous de la ligature, fait le principal obstacle à l'irruption du sang arterial, il sera naturel de conclure, que plus ce gonflement sera considérable, et plus il opposera de résistance à l'impétuosité du sang arterial.

least to be harmless ; it seems to inculcate the tying of arteries with the needle in the surest way. But, here also there is a villany inseparable from all false doctrines, which lead us unawares into very dangerous and very extravagant practices, such as, in our cooler moments, we cannot remember but with regret. Mr. Pouteau insisted upon including all the parts ; he had no scruple, under this ample title of all the parts, to include the nerves ; he considered the tying in also of the nerve, as a security to the tied artery, or, I fear rather, he conceived that it would be a security to his doctrine ; and so he proceeds to represent the tying of the Radial Nerve in an aneurism, as nearly harmless, and the tying the extremity of the nerve in amputation as quite so ; till at last, hardened by bad practices, and blinded by doctrine, some surgeons of the very highest character came, as it were, to play with our judgment, and to sport with their patient's feelings, saying ; " May not the pain upon tying a nerve, as it is smart and of short duration only, somewhat in the manner of volatiles applied to the nose, rather *enliven* the *spirits*, than bring on convulsions\*." This is enough to cure any sensible man of any inclination he may have indulged, to hearken to those who blend theory and facts in this strange fashion, who compare the smart pain, or rather, as I would term it, the shock and terrible violence of tying a nerve, with so slight a matter, as the snuffing hartshorn up the nose. Let any man, who will talk to me on this point, first demonstrate that the tying in of the nerve will do good, before I close with him upon the secondary question, whether it may not do harm. I have constantly observed, that the tying of a nerve gives immediate pain ; so that the patient has always cried with the anguish of it ; and, to say the least of it, there is ever a slow separation of the ligature, so that it is not to be got away, till it be cut out. How else indeed should any ligature hold its place, upon an amputated stump for three weeks, as this of Mr. Pouteau did, unless it were tied round the nerve ? I have seen

\* Kirkland, p. 22.

such consequences arising from tying the nerve in aneurism, as I am not at present entitled to explain ; but which make it a duty with me to advise you against this practice, which is at least superfluous, if not hurtful.

Amidst all this confusion of opinions, there was engendered here, in England, a new doctrine, about the contraction of arteries ; bearing no other mark of authenticity, nor any thing else to command one moment's attention ; but that it has been embraced by some of our most able surgeons, especially by Mr. Kirkland, and by the celebrated Mr. White ; “ For I am now convinced, says Mr. White, in opposition to the doctrine of Mr. Pouteau, which once seemed more probable, that, according to the supposition of Mr. Gooch, since confirmed by my ingenious friend Mr. Kirkland, the arteries by their NATURAL CONTRACTION, coalesce as far as their first ramifications\*.”——Mr. Kirkland says, in perfect harmony with Mr. White, “ that nature suppresses the hæmorrhages from divided arteries, by the natural contraction of their muscular fibres,” p. 10†. But if it really were so, this conclu-

\* Page 171.

† Mr. Aitkin Warrington is also of the same opinion, as may be seen in his pamphlet, p. 173, where he says, “ That the obliteration of the sac, in the extremity of the artery, is caused by its *natural contraction*.” They have been at great pains to found this doctrine on principles and facts. The only facts are the docking of horses' tails, and the cutting off their legs. These are to be found in Mr. Kirkland's Treatise ; and the only principle, that is to say, the only general fact, which I have ever yet been able to discover, is, that an artery closes, not only immediately under the ligature ; but for a considerable way above, that is, up to the nearest inosculating branch. The closing under the ligature is plainly the work of the ligature ; the obliteration of the canal, higher than the ligature, is supposed to arise from this contraction of the artery. The explanation that I should choose to give of the appearance, is this ; That the contraction under the ligature could not be permanent ; that the artery would open the very moment the ligature was withdrawn, if its sides had not adhered. The closing under the ligature, therefore, I consider as the adhesion, which follows the stricture. The obliteration above, I consider as a thickening, or continued adhesion, by the inflammation going a little forward along the arterial coats.

sion should follow, more dangerous than the rash conclusions of Mr. Petit, that the compress or the slightest astringent would be more effectual than the needle ; and that keeping the point of the finger for a few minutes upon the point of any smaller artery, until it had time to contract, would be quite sufficient to stop the blood.

This contraction of the artery, an accident which cannot or need not be denied, does more harm than good ; if it ever suppresses bleeding, it must be only in arteries of the smallest order, the bleeding from which stops thus spontaneously, and needs no particular care. But the contraction of a larger artery often stops the bleeding for a time ; its retraction among the cellular substance hides from the surgeon the arterial mouth from which the blood had flowed ; and thus it bleeds again unexpectedly, endangering the patient's constitution, or even his life ; if the skin heal over it, it forms aneurisms under the skin ; or, where the skin has not healed over it, I have seen it form a sort of aneurism among the soft granulating flesh.

From all that we have seen, we have reason to be jealous of any doctrine, which tends to laxity of practice, in respect of tying even the smaller arteries ; or which holds out any such apology, as the contraction of arteries, or the formation of clots. No modern surgeon, I believe, would think his business securely done, while he conceived any great artery to be secured merely by a clot ; nor will any sensible or cautious man be easy, when he has missed a bleeding artery, or while he is waiting till it contract : Nor will any man who has that degree of dexterity and boldness, which the management of bleeding arteries requires, be satisfied, until he has tied every artery fairly, unless it be in some very difficult or dangerous place ; for it is only to the ADHESION and total OBLITERATION of an artery, that we can trust with safety : How this is best to be procured, may, I think, be made very plain.

We find an artery as capable of inflammation, as any other part of the body. We find an artery described by Mr. Hume as inflamed, not only at the point, where it was tied for a Femo-



ral Aneurism, but also onwards from that point quite up to the heart.—If an artery, insensible as it is, be thus susceptible of inflammation, we know, *a priori*, that the tying it so hard as almost to cut through its coats, will always, or almost always, make it inflame. We have it proved by Pouteau, Kirkland, and others, who intended to prove nothing more than the contraction merely,—that its coats are thickened, and that its canal is obliterated under the ligature, and contracted above it, to a degree which their doctrines of natural contraction or retraction of the artery will never explain : All this is proved by surgeons, who continued talking about the contraction and the retraction of the artery, after they saw evidently, that the internal surfaces of the artery had adhered\*. And finally, the process, as it goes on in nature, is plainly declared by the effects of our common operation of aneurism of the arm ; for there we apply two ligatures, which include the length of two inches of the Arterial Trunk ; they are drawn tight upon the artery, one above the point wounded by the lancet, and one below ; and both these ligatures come away easily (and without our cutting the ring of the ligature) upon the third or fourth day.

How is it that they come away so easily ? How is it thus possible to remove them, without cutting open that ring of each ligature, by which the artery was encircled ? What becomes of the interrupted part of the artery itself ?—Surely it happens here, as in all other cases, in which we apply a ligature, that the part

\* “ Another woman, says Mr. White, having died three weeks after the amputation of her leg ; I was desirous of seeing in what state the arteries were, after the use of the sponge ; and, for this purpose laying bare the Humeral Artery, I cut it open to the place where it divides into the radial, and ulnar branches : I then introduced a common silver probe into each branch, which passed very easily to a certain point, which seemed about an inch from the extremity of the stump ; but could go no farther. I next laid open the arteries to their extremities, and found them entirely closed, near an inch from the end of the stump ; but from that point upwards, their capacities were not at all diminished, nor was there any coagulum or clot of blood in the vessels, or any where near them.” Vid. WHITE'S CASES.

intercepted by the ligatures is killed ! First, The pulse ceases upon drawing the knot of each ligature, which proves that the sides of the artery are compressed. Next the intermediate piece of the artery is fairly killed, rots like a polypus tied in a noose ; and, as a polypus fades on the second, and drops away on the third\* or fourth day ; in like manner, this artery decays, mixes with the pus, leaves the ligature slack on the second, and allows them to be withdrawn easily by the fourth or fifth day. And moreover, it is very obvious, if the artery be thus cut across by our ligatures, as fairly as the older surgeons cut it across with their knife, that its two ends must each have adhered ; otherwise, upon drawing away the ligatures, a hæmorrhagy must ensue. Mr. Petit warns us that even the ligature is insecure ; for if the ligature, says he, falls off before the clot within the artery be strong in its office of stopping the artery, the artery will bleed : But this premature falling off of the ligature, which he apprehended, cannot happen until the ligature has done its business effectually ; or, in other words, one part of the artery will not rot, or give way, before the parts of the artery above and below the ligatures have adhered.

Perhaps the whole process may be represented in few words. The ligatures operate, by making the several points of the arterial canal pass through the several stages of inflammation, from adhesion in one point, to gangrene in another. The space included betwixt the ligature falls into gangrene ; the space immediately under the stricture of each ligature adheres, (the ligature and the adhesion preventing the gangrene from passing higher along the canal) ; and by this inflammation extending upwards and downwards along the artery, its walls are thickened, and its canal obliterated a little beyond the straitened point\*. The adhesion of

\* We find the following account of this process in Kirkland, p. 5. “ An aneurism of the arm, being in great danger of bursting, obliged me to perform the operation : The impulse of the blood against the ligature, at the time of the operation, was very great ; and as a part of the artery (whose diameter was considerably enlarged) was exposed, its pulsations were visible ; but, upon removing the dressings the third day afterwards, the pulsation could neither be seen, nor felt nearer to the ligature than an inch

the artery and obliteration of its canal, are, in aneurism as in amputation, or in other wounds, the only security against bleeding ; and the ligature or comprefs is the only way in which fuch adhefion can be enfured ; and there needs no more than two fhort rules on this fubject, the tendency of which is very plain.

1. If we are to try it with comprefs, let it be chiefly in thofe accidents, and in thofe parts of the body, where we have a good refiftance, as in the temple, the wrift, the tarfus or fore part of the foot, where we can feel the artery lying naked upon the bone. Let the comprefs be a firm and hard one, fteadily applied, well preffed with a roller, fo fixed as not to permit one drop of blood to pafs along the canal of the artery, nor to efcape from the wound ; for that would defeat the intention. Let there be a tourniquet round the limb, and attendants appointed ; for fome have died during the night \*. Let this compreffion be continued thus fteady

and a half ; whence I was led to conclude, that the artery had *collapfed* and *gradually clofed* itfelf up to the neareft lateral branches."

I have obferved, after I had performed the operation for aneurifm, that, on the third day, no pulfe was to be felt at all in the wound ; but I never confidered this as in the leaft wonderful, feeing how very probable it is, that by that time, the ligature muft have cut acrofs the artery, the artery muft have fhunk, and its canal muft have been obliterated confiderably beyond the place to which it has fhunk. But there is alfo another thing particular that Mr. Kirkland, and Mr. White infinuate upon all occafions, that the artery is obliterated juft up to the firft inofculating branch, and always up to it. Mr. White fays,—“ In the arm I have by me, on which the operation for aneurifm had been performed, it is plain to a demonftration by the injection, that the artery was clofed, both above and below the ligature, to the next lateral branch.”

His preparation was, at that time, the only one in exiftence ; “ but I have now by me,” the preparation from the arm of a man who had formerly had the operation for aneurifm performed upon him, and it is fo particularly like Mr. White’s, that, if I were to give a drawing of it, it would be thought to be a mere plagiarifm ; but in this very curious point it differs, that the injection, though coarfely done, and in great hurry, has paffed the great inofculation, (for in my preparation, there is but one great inofculation to fupport the limb), it paffes it a full inch and a half, terminating in a blind fac.

\* We find, in the following tranfcript from Murray, two very

till the fourth or fifth day, for that is the term which we find necessary for obliterating the artery and enlarging the inosculations in aneurisms of the arm ; and it is sufficient : for we find the dilated artery of the thigh itself, obliterated by compression on the

singular things : In the first place, we find two patients allowed to die of bleeding, during the night, after some awkward attempt at curing the aneurism of the arm, in which, according to the oldest fashion, they had tried compression not above the skin, with the hopes of saving their patients from the pains and horror of a bloody operation ; but had first cut up the aneurismal tumor, and then, instead of tying the artery with a ligature, had applied a compress, and applied it so insecurely, that both the patients, from some unwary motion in sleep, had bled to death during the night. This is his fact ; and his opinion, as it is plainly implied in the following words, is very curious. “ If your compression be too powerful, in place of saving the artery, you will absolutely obliterate the artery ; but if you compress lightly with design of saving the artery, you are never out of danger of an alarming, or even fatal hæmorrhagy.” This language very clearly implies, that Murray, like most others, expects from compression not an obliteration of the artery, but thinks, as Heister did long ago, and Mr. Morrand more lately (*Vid. Acad. des Sciences, Vol. V. p. 172. octavo*), that the compress, by suppressing the quick motion of the artery, heals the wound,

“ Murray speaks thus : *Frustra itaque, si firmam compressiōnem instituiamus, conservatiōnem arteriæ expectamus, in leviore autem, qualis ad scopum obtinendum requiritur, hæmorrhagiæ repetitæ quæ chirurgi animum quam maxime sollicitant : atque etiam ægrum ad ultimam sæpe metam detrudunt, vix evitari possunt, leviori sub somno, motu brachii, quo compressio aliquantum fuit perturbata, binos ægros Montispesulani vigesimo post operationem die, hæmorrhagia exitiali correptos fuisse, narravit cel. Præses. (viz. Murray.)*—*Vid. Arvidson Murray, p. 20.*

All authors have believed that, when they cured aneurism by compression, or by sponges, they healed the wound of the artery. Mr. Morrand, of the French Academy, says, in the following passage, that he cured an artery wounded with the lancet, in a manner very different from that in which we use the ligature. “ I need not, says Mr. Morrand, mention the several precautions which I took after applying Mr. Brossard’s agaric to the artery.” I shall only observe, that the pulse, which was interrupted for twenty hours, returned at the end of that time, and that I cicatrized the wound in a month.” “ *Je dirai seulement que le pouls intercepté à la main pendant environ vingt heures, se manifesta au bout de ce temps là,*” &c. p. 168. I dare say my reader has a tolerable notion what this interruption of the pulse means ; and what Mr. Morrand was doing with his puff-ball.

fourth or fifth day. Be bold enough also, if it be the great arterial trunk of the limb, to draw your rollers till the limb be absolutely without pulse, and cold : for this operation with the compress, though apparently milder, is quite the same with tying the artery with the needle.

2. If it be your design to obliterate the artery by ligature, your business is more easily and surely, and rather more quickly done. You must see your bleeding artery fairly, tie it clean and clear of all surrounding parts ; tie your arteries with ligatures well proportioned to their size, not clumsy and rigid, but rather small, perfectly flexible, and moistened with oil, that they may glide easily ; draw them pretty tight, so at least as to lay the sides of the artery in contact, and till you see a pulse above your ligatures, and none below ; but never draw them so as to run the risk of cutting the artery.

Hence, I think, the general conclusion is, that if you understand the principle of your operation, and do it with the proper precautions, you will be sure to make good your point, whether you tie, or whether you compress the artery ; and this easy adhesion of an artery I take to be the chief reason why every man hitherto has been pleased with his own little discoveries, and every surgeon is still pleased with his own methods, whether they be or be not perfectly regular and correct.

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BUT, in this great subject, there is yet more to do ; for there are many accidents in which we cannot operate with the compress or with the needle, in which we must use the styptics, puff-ball, or sponge : And, of course, it may be right to give you a short account of these means of suppressing bleeding, for disputes about the causes by which bleeding arteries are stopped are useless, and to those who delight in them, endless ; unless there were found some one Catholic authority, by which the points might be settled at once : But we ought to be chiefly desirous of knowing the means by which this end is accomplished. Though there are four



chief methods of suppressing hæmorrhagy, viz. cauteries, astringents, fungi, and the ligature, there is one only, viz. the ligature, that is absolutely secure.

1. BURNING IRONS were used by the ancients, merely because they knew of no other means of suppressing the bleeding ; and we cannot wonder that the ancients were so curious in the degree of heat : or in the way in which it was to be applied ; or in the shapes of their irons, which were conical, that they might touch nothing but the point of the bleeding artery ; nor in the choice of their metals, preferring such as were susceptible of only a moderate degree of heat : for if they heated their irons too little, they did nothing ; there was no eschar formed, and the bleeding was not stopped ; if they burnt too much, the slough, though fully formed, fell off almost as soon as the iron was withdrawn. But let them burn ever so cautiously, the sloughs were to fall off sooner or later, and it made little difference whether they fell off on the first or on the second dressing, on the fourth or on the eighth day ; and, as they were in continual fear of this, they never undid the wound, without having a tourniquet round the limb. At every dressing the patient was tormented with the irons, and at every succeeding dressing he lost more blood, so that the last condition of that man was worse than the first.

It was in those times that the invention of a new cautery, or a new shape for the iron, was thought meritorious. It was then, also, that Fabricius ab Aquapendente, published his new method, as he calls it, of cutting out a cancerous breast : “ For if it be a moveable cancer, I cut it away,” says Aquapendente, “ with a red hot knife, which sears or burns as it cuts ; but if it be a cancer adhering firmly to the thorax, I cut it, without either bleeding or pain, with a wooden or horn knife soaked in aquafortis, with which, having cut through the skin, I then do the rest by digging out the gland with my fingers \*.” These are methods real-

\* Ego autem, etsi nil tale facere molitus sum, si essim faciurus, ut dolorem primo vitarem, et sanici profusionem, si cancer sit mobilis, ipsum forcipe hoc apprehenso statim cultro, uno eodemque

ly deserving of the encomium which Mr. Dionis put in the author's name. "They have chiefly the merit, says Dionis, of killing two birds with one stone." "On ferait d'une pierre deux coups \*."

But it must not be forgotten that there are cases where even this horrid method may yet need to be used, as in bleedings from the gums, cheeks, palate, or tonsils, or other parts within the mouth.

2. The STYPTIC SOLUTIONS, powders and doffils of various kinds, came next into use ; for surgeons, practising chiefly the actual cautery or hot iron, were naturally led next to think of the various substances, which are usually called Potential Cauteries, and which are chiefly metallic or earthy salts, as silver caustic, vitriols, corrosive sublimate, alum, or the mineral or vegetable acids ; which are, when diluted, gentle stimulants, or, as they are called, astringents ; exciting contraction of the vessels, and forming coagula upon the bleeding surface. Before surgeons came to use the needle freely, they often trusted to caustics ; but, in using buttons of vitriol, or little bags of it in powder, applied to the end of each artery, they found that, by this method also, the end of the artery was destroyed, as by the burning irons, and sloughed off, and required the application of the tourniquet, every time that the dressings were undone, and, at each dressing, the application also of new vitriols. Even after they came to use the needle freely, it seemed to be a harsh method. Surgeons were still hoping to find some less painful one ; which easy and credulous temper, in men of our profession, has given the tone to those

*tempore candente et incidente opus peragerem, ut forcipe valide constringente sensus partes hebetetur, cultro incidente amputetur cancer, et eodem candente sanguis supprimatur. Quod si cancer manillæ adherens et firmus sit, neque stringi possit, excedendus omnino est, atque ad vitandum et dolorem et profusionem, excederem cum ligno aut cornu, aciem habente intincto tamen subinde in aqua illa, qua aurifices ab argenteo aurum separant, quam fortem vulgus nominat, quo tota cutis in circuita mamillæ incidenda est, postea digitis potissimum et unguibus mamillæ glandulosa substantia á subiecta parte separanda.*

\* Dionis, page 362.

unacquainted with subjects like these, and has left the public ever credulous, open to the practices of quacks, and nostrum-mongers. We have now tolerable specimens of all that can be produced from the vegetable or mineral kingdom, to serve as styptics, and find them good for nothing ; we know that no acid, spirituous, nor saline body, ever acts as a styptic, without causing pain ; what then should we expect from the random inventions of ignorant people, whose only trade is that of cheating the public, and whose only skill is that of contriving or managing the deceit ? What have we, who can manage every thing by compression, or with the needle, to do with styptics ? Or why should we suffer this continual succession of trashy compositions, under the title of vulnerary balsams, styptic solutions, styptic powders and the like ? Since, from the time of Rabell, down to the celebrated Ruspini, we have found disappointment come quick after each fit of anxiety and expectation ; and since we have much reason to believe, that the best of these are little else than acids, spirits, turpentine, or trifling solutions of some astringent gum.

Rabell was a German chemist, and, having come to Paris with his styptic, he so wearied the king, and Mr. Louvais, with entreaties and solicitations, that, after long attendance, he obtained leave to use it upon one of the soldiers in the Hospital of Invalids. This poor man's leg having been amputated in the usual form, the surgeons and physicians of the hospital, delivered him up to Mr. Rabell, who had hardly finished the first application of this styptic, before the blood came draining through all the dressings. He doubled the dose of his styptic water, dressed his stump firmly a second time, but still the blood flowed \* ; so that in a little while, and in presence of all the assistants, the unhappy subject of this cruel experiment, died under his hands ; either they had not had that fear, which they should have had for the patient's life, or they wanted humanity or resolution enough to stop this horrid experiment ; but they made some amends by procuring an order

\* This Eau de Rabell, so famous in France and Germany, was just a mixture of strong spirit of vitriol, and spirits of wine.

from the king, prohibiting Rabell, under the severest penalties, from repeating this attempt.

We have seen the latest of these inventions, Ruspini's styptic, tried in this place, where I believe it is esteemed as of much the same value with the sympathetic powder of that famous Knight and most complete Gentleman, Senelm Digby ; which sympathetic powder staunched the blood as effectually, when it was applied to the weapon, as when applied to the wound itself\*.

But here also it must be remembered, that though no styptic, wash, or powder, is to be put in competition with the needle, nor to be used in amputation, or in any great wound ; styptics must be useful in all internal hæmorrhages, as from the nostrils, throat, alimentary canal, &c. or in any broad bleeding surface, where no particular artery can be seen.

3. The *AGARIC* of the *OAK* was first used about fifty years ago. It is a fungus growing upon old oaks. It is gathered in August or September ; is prepared by long keeping in a dry place, cutting away the outside rind, beating it till it softens, so that it begins to yield, and can be torn with the fingers. It is of the colour and appearance of chamoy leather, but spongy and loose ; in the country parts of Ireland, it is actually called oak-leather. A piece of this fungus, put down and settled with a

\* This I believe is the same knight, whose gallantry and loyalty carried him to such excess, that he burst the arteries of his legs, so as to form aneurisms, by kicking open the doors of the den in which the boar was confined, which the King was to hunt ; but whether his aneurisms needed to be opened, or whether he used his sympathetic powder, or whether he applied it to the door, or to his own hams, the German writer, who tells this story, does not declare.

“ Vidi equitem Digbeum, anicum, egregium philosophum, chimistam, cujus præscripta medica curiosa typis mandata Parillis, a Trefelio mihi dicata fuere ; exortæ illi fuere venæ variceformes in tibiis, cum pedum impulsu conaretur infringere fores segti ferarum, quibus Rex Angliæ adstabat, quocum venatum ibat : Forte contigit in eo occurſu ut tunica arteriarum media crepuerit, ipsa autem arteria admodum dilatata ; tunc temporis tumor longitudinem arteriæ insequitur, in extensione vim patientis.”—Zodiac. Med. Gall. p. 45.

compress and bandage over the mouth of any wounded artery, does precisely the office of a piece of a sponge : And as for the character of this particular remedy, I should say that, had it been invented in the days of Celsus, when they were cutting off limbs, not with the assistance of the tourniquet, but by the gripe, (i. e. by assistants grasping the thigh, when they were searing the arteries with their burning irons, it must have been of infinite value, and must have saved many lives ; but coming as it did in competition with the needle, it must have delayed the general use of the needle, and must, no doubt, have endangered many lives, and was in no respect worthy the high praises bestowed upon it by the Academy of Surgery, nor of those liberal rewards, which the King of France bestowed upon Mr. Brossard. The privilege of rewarding merit is no doubt a high one ; but I fear that such rewards are rather a general bribe, for the concealing of useful inventions : while an invention really useful, will be in the same degree honourable ; and in our profession, most of all, every useful invention will reward itself.

4. The SPONGE, which has been used chiefly by the celebrated Mr. White, is more useful than the agaric ; it is like it in its operation, is really of value in practice, not to take precedency of the needle, but to assist it. The sponge can be very thoroughly dried, it can be compressed into a very small compass, it can take any shape, and may be thrust down into cavities and narrow wounds, where the needle cannot go, it can be made so hard, and pressed so firm, by laying compresses over it, as to have at once the effect of a compress and of a sponge ; or rather of a compress having this curious property, that at first it presses moderately, but if one drop of blood escapes, that is absorbed, so that the compress still preserves its contact with the bleeding artery, and swells and presses harder, exactly in proportion as such pressure is required.—This plainly is the effect of a sponge, whether it be nitched in betwixt two bones to compress an artery which the needle cannot reach, or whether it be laid flat upon an open sore, as after cutting out the breast, or after an amputation done ac-



according to the old fashion, where the surgeon used to dress his stump open, and to heap compresses tied with a firm bandage above each piece of agaric sponge. The agaric possessing a degree of this property is of use ; even our common charpie possesses this quality of absorbing and swelling in a slight degree. But the agaric and sponge are both so excellent in this respect, that even those, who are the least inclined to use them, must acknowledge, that though the agaric will often fail, it has yet enabled surgeons to perform the greater amputations, as of the thigh, safely, without using the ligature, as is excellently proved in the trials by Mr. Warner, at the desire of the Royal Society, as well as by the inventor, assisted by Messrs. Fagel, Bouquot, and Morrand, in France. And the sponge, as is proved by Mr. White's practice, is the only thing that can stand by the side of the ligature to assist it. I am sensible that, by thrusting down a sponge, I have saved a patient's life, when I am not sure that I could have extricated myself by any nicer operation.\*

This point, then, of the value of the agaric, bovista, puff-ball, (or by whatever other name various surgeons have known these fungi,) and of the sponge itself, without farther explanation, can be easily settled thus.—Had they been discovered in the times of the old surgery, when cauterics were used, they must have saved many lives : But now, when we know well how to use the needle, they cannot come at all in competition with that surer method.

\* The chief Papers, upon this subject of the use of the fungi, of puff-ball, agaric, fungus vinosus, (a fungus that grows in wine cellars,) &c. may be seen in the Philosophical Transactions, or in the Academy of Sciences, about the year 1756 ; and there will also be seen some indications of the confused notions they had about these fungi ; considering them not merely as sponges, but as containing some hidden inexplicable virtue in restraining hæmorrhages : this is best understood by the experiments of one man, who, resolving to be very wise,—or like a true SOCIETARIAN, —(as Dr. Hill would have said,) BOILED IT !! “ I have tried it, says this gentleman, in female cases, with *great success*, by injecting a STRONG DECOCTION of this fungus into the womb, in hæmorrhages from the womb, and especially in fluxes, after delivery.” Vid. Philosophical Transactions, p. 265.—He had better have injected a STRONG DECOCTION of Album Græcum.

The thrusting down a sponge into any wound, is absolutely inconsistent with our common intention of immediately reuniting that wound ; and the tying of arteries must, in amputations, in aneurisms, and in all simple wounds, be preferred, for two reasons, both as it is the surer method, and as the ligatures of the arteries hang out from one corner of the wound, and do not hinder us from reuniting or even from sewing it up.

The use of the sponge is plainly limited to the cases of difficulty or danger.—Of difficulty, as where we cannot see the bottom of a deep wound ; where we cannot see the bleeding artery ; where we dare not cut far down to the artery, on account of the nearness of some other great artery or important nerve ; where we cut forwards with the knife, and would not willingly use the needle by making a plunge in the dark.—Or of danger, as when it happens, as it sometimes does, that the needle has already failed ; where the bleeding is from the head, or in the trunk of the body, and is not to be commanded by a tourniquet ; where we do not mean to heal by adhesion, or where the danger from bleeding is so great, as to put out of the question all trivial considerations about the quick healing of the wound ;—where the bleeding is very furious at the bottom of some deep wound, filling it with blood, so as to hinder us from seeing the bleeding artery, and preventing us from using the needle, or, at least, preventing us from using it deliberately or safely ; or where the bleeding is from some general surface, and not from one particular artery which can be seen, and tied ; or where, though the artery can be distinctly seen, it lies among putrid flesh, and is itself so putrid, in a gangrenous and foul cavity, or on the surface of an unhealthy stump, that the needle either cannot be used, or will not keep its hold.—These are the difficulties and dangers, which force us to retain the sponge, though we prefer the ligature.

Last of all, the LIGATURE of the ARTERIES was invented by the celebrated PARREUS, who was first surgeon to four successive kings of France. His high fame, descending thus for ages, must

make you desirous of knowing what was the real character of the man ; and there is no one point upon which his character turns so much as this single invention : for of all the improvements of this practice, this of tying arteries was that of which he was the proudest, venturing to say, “ for the good of mankind ; and the improvement and honour of surgery I was inspired by God with this good thought.” And as it was the highest of all his improvements, it was that for which his enemies envied him the most.

The fortune of Paræus was very singular ; he was at once the chief surgeon, the counsellor, and the private and familiar friend of our four successive kings of France. He attended them in their retirements and looser hours, he followed them into the field, through all those dangers which were in those days part of the duties of a king ; and which his writings display to us, with a faithfulness and minuteness of description which the historian should hardly disdain. He had the good fortune on one occasion to save manifestly the life of the king, when his arm had been so hurt in bleeding, that it was three months before Paræus could accomplish the cure. And this man was of such rare abilities, and so much valued by the king, that he alone was saved alive in that horrid massacre of St. Bartholomew’s day, which remains an eternal blot upon the French name.

But of all his good fortune this is the most remarkable, that it was he alone, who, by his influence over the king, put a stop to this unparralleled butchery, after it had continued in all the quarters of Paris during two days—The feelings of the king after those dreadful days of carnage and most sacrilegious murder, and the familiar and even tender manner of his complaining to Paræus, are told by the Duke de Sully very feelingly ; for he was himself of the Reformed religion, and though yet a child with difficulty escaped.

\* “ The hour is now come, said the king, when all France

\* “ Que ce Prince lui ayant dit le jour du massacre, qui c’étoit à cette heure, qu’il falloit que tout le monde se fit catholique.

shall be of one religion." "Now, by God's light, Sire, (replied Paræus), I think you will never forget your promise to me, that there were four things you would never force me to do :—To enter again into my mother's womb ;—to go out in the day of battle ;—to leave your service ;—or, to go to mass.—The king then took him aside, and opened up to him the troubles with which his soul was disquieted.——“ Ambrose, says he, I know not how it is with me, but it goes so heavily, that within these three days, I am as in a fever ;—indeed I am ill, as ill in mind as in body ; sleeping or waking, the murdered Huguenots are ever before my eyes, with hideous faces weltering in their blood.—Would to God the children and the aged, at least, had been spared !” The order for stopping the massacre, which was proclaimed the following day, was the result of this conversation.

There had long been an open war, about privileges and dignities, betwixt the surgeons and physicians ; and that was one cause of settled malignity and discontent. That Paræus, surgeon merely, should venture to write so large a book on surgery, and should make it, according to the grotesque taste of that age, a good and learned book, was high matter of jealousy and offence, and for this reason alone, was Paræus accused of ignorance in the Latin language, and of hiring young physicians, (as if young physicians should be more capable in surgery, than old surgeons), to write his books. That Paræus's abilities should have raised him to stations of honour, or made him thus familiar with a race of princes

Parée lui répondit sans s'étonner : Par la lumière de Dieu, Sire, je crois qu'il vous souvient m'avoir promis de ne me commander jamais quatre choses ; savoir, de rentrer dans le ventre de ma mère, de me trouver a un jour de bataille, de quitter votre service, et d'aller à la messe.” Le Roi le prit, et s'ouvrit a lui sur le trouble dont il se sentoit agité. “ Ambroise, lui dit-il, je ne sçais ce qui m'est survenu depuis deux ou trois jours ; mais je me trouve l'esprit et le corps tout aussi émus, que si j'avois la fièvre. Il me semble a tout moment, aussi bien veillant que dormant, que ces corps massacrés se présentent a moi, les faces hideuses et couvertes de sang : je voudrois bien qu'on n'y eût pas compris les imbeciles et les innocens.” L'Ordre qui fut publié le jour suivant de faire cesser la tuerie, fut le fruit de cette conversation.

—SULLY, Liv. I. p. 23.

not too apt to condescend, must have been a fore grievance to all his enemies, or which is the same, to all the physicians ; but most especially, to such a man, and such a physician, as Gourmaline, whose taste in learning and in manners, and whose habits of mind, are best explained, by showing the kind of language, with which he assailed Paræus.

“ It was then very forward, rash, and presumptuous, in a certain person, to venture upon condemning the cauterizing of bleeding vessels (after cutting off a mortified limb), a method so highly and continually commended and approved of by all the ancients ; teaching in opposition to that, without any authority, without knowledge, without experience, without good sense, some new method of his own, of tying arteries and veins.” And in the end, he proceeds to call him *carnifex*, and other names, which it is needless to repeat \*.

Paræus, familiar as he was with Kings and Princes, was not to observe the very strictest rules, with an antagonist like Mr. Gourmaline ; but in the answer which he made to this heavy charge, we perceive, through his sharp reproof of Mr. Gourmaline, mixed as it is with indelicacies, which the fashion of the time gave countenance to, the natural good sense, and the right education of Paræus, and the true grounds on which his character was founded ; which last he explains to us with a confidence and steadiness, well becoming such a man †.

\* *Male igitur et nimium arroganter, inconsultus et temerarius quidam vasorum unctionem post mortui membri resectionem, a veteribus omnibus plurimum commendatam et semper probatam, damnare ausus est : novum quendam deligandi vasa modum contra veteres omnes medicos sine ratione, experientia, et judicio, docere cupiens, nec animadvertit majora multo pericula ex ipsa vasorum deligatione (quam acu partem sanam profunde transfigendo, administrari vult) imminere, quam ex ipsa unctione.*

† *Davantage vous dites, que vous me montrerez ma leçon aux opérations de chirurgie ; il me semble que ne sçauriez, parceque je ne l'ay pas apprise seulement en mon estude ; et par avoir ouy par plusieurs et diverses années les leçons des docteurs en medecine : mais comme j'ay escrit cy-devant en l'epître au lecteur, j'ay fait residence en l'Hôtel Dieu de Paris par l'espace de trois ans, ou j'ay eu moyen de voir et apprendre beaucoup d'œuvres de*



"You boast, moreover, Mr. Gourmaline, that you will teach me my lessons in surgery, and my operations ; but in that I believe, you are a little mistaken ; for my education has been quite after another fashion. I have learnt my art, not in my closet ; no, nor by hearing the discourses of physicians, though that, also, I have not despised ; but in the Hotel Dieu, where I lived for three years, seeing many diseases, and learning many operations upon the living body : and learning also much of the anatomy upon the dead ; and of this I trust I have given sufficient proofs in the public schools."—"But I have yet more to boast of ; for, being called into the service of the kings of France, I have in my time, served four successive kings, and I have followed them in battle, and in skirmishes, and assaults ; sometimes also blocked up with the besieged, curing their wounds."—"And last of all, I have lived in this great and famous city of Paris, many long years, where, thank God, I have been held in some repute, and ranked at least equal with my peers ; in so much, that there have been few difficult, or famous cures, in which my head and hand have not been employed.—How ! seeing these things, dares such a man as you, who have made surgery no part of your study, talk of teaching me \* ?"

chirurgie, sur une infinité de malades, ensemble l'anatomie sur une grande quantité de corps morts, ainsi que souvent j'en ay fait preuve tres salsissante publiquement aux ecoles de medecine de Paris, &c.

\* It may not be amiss, to insert the following quotation, as a specimen, of the manner and language of those times, and I am directed to this passage, by a good mark, the Marginal Index ; where I find the following sharp taunt, entitled by Paræus, "*Belle Similitude.*" P. 781.

"You remind me, Mr. Gourmaline, of a little scrubby boy, who had come from lower Brittany to Paris forsooth to learn French ; and one day the organist of the great church of Notre Dame, found him lounging about one of the gates of the Palace, and took him to blow the organ. After three years, this little, round, s—t—a—d fellow, (*bien fessu et materiel,*) finding that he had learned not one word of French, returned to his father : telling him that now he could speak good French, "and besides, Vather, says he, I can play upon the organs," (*et lui dit qu'il parla bonne Français, et davantage qu'il scevoit bien jouer des or-*

You may see by this introduction, (for this is the introduction to the book, which he calls his Apology, and his Voyages), that he prepares to defend his invention of the tying of arteries, with true spirit. He both defends it practically, and he also defends it learnedly ; for he was required to prove, that the principles, at least, if not the absolute practice of this operation were to be found in the writings of the ancients ; but after all his searching among the works of Galen, Celsus, Avicenna, and the rest, we find him

gues). The father quite delighted with such a son, goes straight-way to the organist of their great church, “ Do, says the father, let my son try the organ ; for I long to know whether he be such a proficient as he says he is.” The organist very obligingly went along with them, and the boy having got into the organ, presently claps himself down by the bellows, with a sort of instinctive jump. “ Why, what’s this, says the organist with great simplicity ?”—“ O nothing, says the boy, only you had best play upon the organ, for I play best upon the bellows.” “ Now I tell you, Mr. Gourmaline, that you have been all this while playing upon the bellows, while I have been playing upon the keys ; it is a vastly easy matter, for a fellow like you to heeze upon his chair and prattle about it ; but performing surgical operations, with the knife in hand, is quite another affair.” P. 781.

*Partant, il est á croire, que n’avez jamais fortý de vostre estude, que pour enseigner la theorique (si vous l’avez pû faire) les operations de chirurgie s’apprennent á l’œil et au toucher. Je diray que vous ressemblez á un jeune garçon Bas Breton, bien fessu et materiel, qui demanda congé á son pere pour venir á Paris prendre France. Estant arrivé, l’organiste de Notre Dame le trouva á la porte du palais, qui le print pour souffler aux orgues, ou il fut trois ans. Il vid qu’il parloit aucunement François, il s’en retourne vers son pere, et luy dit, qu’il parloit bonne France, et d’avantage, qu’il sçavoit bien jouer des orgues. Le pere le recent bien joyeux dequoy il estoit en si peu de temps si sçavant ; il s’en alla vers l’organiste de leur grande eglise, et le pria de permettre á son fils de jouer des orgues, á fin de sçavoir si son fils estoit bon maistre ainsi qu’il disoit ; ce que le maistre organiste accorda volontiers. Estant entré aux orgues, il se jette de plein faute aux sufflets, le maistre organiste lui dit, qu’il jouait, et que luy souffleroit ; alors ce bon maistre respond, qu’il jouait luy mesme des orgues s’il vouloit ; car quand á luy il ne pouvoit jouer que des soufflets. Je croy aussi ; mon petit maistre, que vous ne sçavez autre chose que caqueter en une chaire ; mais moi je joueray sur le clavier et ferai resonner les orgues ; c’est á dire, que je ferai les operations de chirurgie, ce que ne sçauriez nullement faire pour n’avoir bougé de vostre estude et des escholes, comme j’ay dit.*

happily unable to produce any such authorities, as might hurt his own claim to the discovery, or benefit his cause.

But he proceeds next, in a style more natural to him, to prove it by facts ; by his amputations, and other operations, and by his doings in other dangerous wounds, attested by his assistant surgeons, men of the highest name, and especially by Guillimeau, who then lived in the house with him, as a pupil, and who acquired in the end, a character worthy of his breeding : But what most of all delights me, is to observe how perfect the system of Paræus's practice was, in respect of hæmorrhages and the securing of arteries.

“ If there be a bleeding artery, says Paræus in any wound, dress the wound with astringents ; but be careful, at the same time, to lay a firm compress over the wound, and settle it well with a bandage, and then lay out the wounded limb in an easy way.”

“ If this do not serve, clap your finger upon the point of the artery, and wait patiently till a clot be formed.”

“ If the artery still bleeds, cut up the wound, if it have been sewed, and pass a needle under the artery, taking up with it, in the ligature, much or little flesh, according to the circumstances of the case.”

“ If the artery have shrunk up among the flesh, cut up the wound above the artery, and tie it.”

“ But should both ends of the artery have been still farther retracted, then continue your incision, and cut open the skin freely, still pursuing the artery ; but still careful of the very artery that you are pursuing, lest you should cut it a second time.”

“ In an amputated stump, draw your arteries out with the forceps, tie them neatly with a thread ; but if once you miss the artery, or your first thread give way, do not use the forceps any more ; but pass a needle four inches long into the stump, so as to tie in the artery, along with much of the flesh.”

This is a system of instructions, which is fairly extracted from Paræus's books, without mending the text ; and though this system be now one hundred and fifty years old, it is such as, I be-

lieve, the best surgeon at this day in Europe could hardly improve ; for, in correctness of practice, surgeons, from his time, went backwards for many ages, (at least, in this point ; ) nor did they argue, because their judgment was not convinced ; but, on the contrary it was by arguing upon a plain point, that they unsettled their judgments ; for, from the moment that they began to argue, this part of practice ceased to improve ; monstrous fancies haunted their imaginations, which some were glad to turn into arguments against a new practice ; while others were really afraid. First, they were afraid lest the ligature should give way, and they said it would cut across the artery ; it would make the end of the artery mortify ; it might be thrown off by the continual beating of the artery, so they stitched it up, and cross-tied and knotted it, and took all kinds of security. They not only tied one ligature round the artery, but they at the same time transfixed it with a needle, and then twisted together the knots. Then, like children, afraid of what they had done, they feared lest this firm tying of the artery, should occasion locked jaw, or universal convulsions ; so that on their amputation table was produced nothing smaller than tapes, and their needles, which were three or four inches long, were carried round each artery, at the distance of an inch. It is only after much experience, and by very slow degrees, that we have learnt, at last, that the drawing out an artery with the forceps or tenaculum, and the tying it clean with a small ligature, the method which appeared to the older surgeons to have every fault, is absolutely the most secure.\*

\* There is a defect in the common ligature, made with the needle, which has not been sufficiently observed ; for not only is there always much flesh included along with the artery, which fades, so that the artery is again free ; but the ligature, passed with the needle, does not go round the artery in a circle, but up on one side, and down on the other, in a scolloped form, which gives a double effect, to this unavoidable fading of the parts ; but yet this is a trifle to the general question.

## R U L E S

FOR STOPPING THE HÆMORRHAGY FROM ALL SMALLER  
ARTERIES.

1. STYPTICS can avail us very little in any dangerous hæmorrhagy, and they stand in our list, chiefly because they were valued by the older surgeons, who, though they used the needle, never could rid themselves of all their prejudices, and use it freely. With us styptics are of little value, so that we never think of using them, except in bleedings from arteries of the very smallest size ; where the hæmorrhage is of so little danger, that we would not trouble our patient with the sharp pain, which the needle causes ; we do not use them where we see the bleeding artery, or where we can use the ligature, or the compress ; we find them useful, chiefly in oozings of blood from hollow passages, as in bleedings from the nostrils, the gums, the throat, the womb, the alimentary canal, or in bleedings from foul ulcers, from the cavities of deep sores, or from any broad and diseased surfaces, where the bloody exudation may be checked, and the condition of the surface mended at once, by the stimulant nature of our styptics. The best of which are diluted vinegar, or spirits, or mineral acids, or solutions of alum.

2. There are also cases, where we should choose to disregard the bleeding from the smaller arteries ; even though they be of such size, as to be seen throwing out their blood by jets ; we perform few operations, in which we do not see little arteries throwing out their blood, which, before we have finished our incisions, have shrunk, and have injected the cellular substance round about them, so that it is thickened, and their mouths are closed. Such arteries are no more heard of, and the cure goes on well. And, in like manner, we often see little arteries opened, in wounds which we disregard altogether, we allow them to exhaust themselves ; keep the wound exposed to the air ; and when the bleeding and general oozing relents a little, we clear the wound ; or we at least take away



the grosser clots of blood, which might prevent the reunion of the wound. Then we lay the lips of the wound together ; and then we lay our compresses in such a manner, as to press the lips of the wound to each other, and to press the cut surface of the wound to the bottom of the wound ; so that these compresses, which thus procure the adhesion of the wounded surfaces, prevent, at the same time, any farther bleeding within. The bandages of such a wound should be painfully tight at first, and may be slackened in a few hours.

3. In all hæmorrhages, where we have a full and rather dangerous bleeding, and in which we see distinctly one or two great arteries or veins throwing out blood, the bleeding must be suppressed either by the ligature, or by a steady compress, and the ligature, wherever we can use it easily, ought to be preferred.

4. If an artery of a smaller order, and lying firm against some bone, as in the hand, or foot, or temple, be cut ; or, if either by stabs, a small aneurism be formed, as in the wrist, or at the root of the thumb ; or if, by a blow, the artery be hurt against the bone, and bursts, so that a small beating aneurism ensues ; in such cases we do not always go regularly to work, nor do we choose to give the patient the pain of opening such a tumor ; but sometimes by departing from the general principle, we manage the particular case more easily, by applying a compress, which, being tied down hard and firm for two or three days, obliterates the artery, by flattening it against the bone. The blood of such a trivial aneurism is as easily absorbed, as that bloody tumor is, which we see so often on the heads of children immediately after birth. It is just by such a compress, that we stop the Temporal Artery, after opening it with the lancet.

5. The manner of making compression to obliterate an artery, must vary according to the circumstances of the case : Sometimes, as in aneurisms, it should be made above the skin, and on that part of the artery where it is just entering into some small aneurismal bag, and the artery which feeds the aneurism being thus obliterated, the blood already extravasated will be ab-

forbed and the little tumor itself will quite disappear, leaving but a little thickening or perhaps none. Sometimes, as in wounds, we make the compression within the wound, cleaning it, looking for the place where the artery is, and perhaps there can be no better nor firmer compress, than a small pellet of chewed paper, a piece of cork, a piece of folded leather, a piece of firm sponge or agarie, a firm compress of folded linen ; any thing will do for a compress, if it be but firm in itself, and neatly applied. The compress interrupts the cure by adhesion but for a few days : for, when it is withdrawn on the second or third day, the parts may then be laid down so as to adhere.

6. But the arteries of the wrist, the palm of the hand, the fore part of the foot, &c. are of so great a size, that though when bruised, or hurt, or stabbed, and the skin healed over the hurt artery, the aneurism is commonly of a trifling size, and easily cured ; yet these arteries being cut by working tools, a carving knife, &c. in the wrist or the foot of a large and strong man, there ensues a scene of terrible confusion and perplexity ; which perplexity is itself the chief cause of such loss of blood, as often injures the constitution, when it does not endanger the life : for the friends gather up napkins and cloths confusedly, wrap them loosely and in a hurried way round the limb, and each cloth, as soon as it is soaked in blood, they remove, as if they had no other intention than the childish one of hiding from the patient what quantities of blood he is losing ; while if, in place of this general pressure of cloths wrapped round the limb, they could have but the boldness to look upon the bleeding wound, and press upon the very point where the artery was bleeding, they might with one finger only suppress it, and with a single touch. Then, let the recollection of this be a lesson to the surgeon, and let the very sight of this confusion put him in mind of his duty, which is to whirl off those confused bloody cloths as quickly as possible, and press the point of his thumb or finger directly upon the bleeding vessel.

7. The bleeding being thus restrained, let the surgeon clean the limb, appoint his assistants, lay the land upon a table and pil-

low ; or, if it be the leg, lay it out firm upon a stool. If he have no good assistants, let him make a temporary tourniquet with a common garter, and any stick ; but if he have any professional man to help him, then he should still prefer the suppressing of the bleeding with the point of the finger, because in a moment he can let go the artery with one jet,—can close it again as suddenly ; in short, he can let go the bleeding artery more quickly, and can see it oftener and with less loss of blood than in using the tourniquet. Having thus fixed his eye upon the bleeding artery, he either draws it out with the hook or forceps, or he strikes his ligature under it with the needle ; or, if neither of these can be done, then he puts either a regular tourniquet, or this occasional tourniquet round the arm, and cuts up the wound freely, till he sees the artery bleeding with open mouth.

8. Whatever blood the patient loses before a surgeon arrives, is part of the natural danger of his wound ; but it is a great dishonour to the surgeon, if he lose much blood after he arrives. Successive bleedings, successive divisions with the needle, the taking in of arteries, tendons and nerves, all in one great ligature, and hæmorrhages still succeeding these clumsy operations, are far from being honourable for the surgeon, especially since these wounds of the fore arm, or leg, or hand, or foot, are in parts where we may use greater freedom. The surgeon, then, should do his operations boldly ; he should not be sparing in his first incisions, (if he have but knowledge enough of the cross ligaments, tendons, and nerves, to make such incisions safely): for, if once he suffer this wounded artery to assume an aneurismal form, if he oppose the blood by slight compresses, suffering it all the while to bleed within, the artery will shrink, the cellular substance be crammed with blood, and the skin be thickened by inflammation also ; the seeking out of the artery among such a confusion of parts, will be inconceivably difficult : both because the artery does not bleed so as to direct us, and because it lies deep, and because the surgeon cuts very timorously ; for even a bold man will be apprehensive when he finds himself cutting through parts which he does not

understand. And, in this particular case, the parts are so massed together, that he can distinguish no one part from another, unless he prolong his cut either above or below the place in which the blood is extravasated where the arteries are free ; in short, as he cuts through two inches of confused substance, and on so naked a part as the wrist (*e. g.*) he hardly doubts that he is cutting through muscles and every thing, while in fact he is cutting only through the skin, thickened to this degree by inflammation that has lasted for two or three days, and by the continual driving of the blood.

The rule which arises out of this representation of the case is very plain, *viz.* not to be sparing in the first incision ; to do this first and great point of the operation decidedly and boldly. The leaving no doubt about the tying of the artery, and no possible occasion for future incisions, is in the end the greatest saving of pain ; the first operation is easier than the second, and the second operation is easier than the third. It is owing to this lenient practice of making a small incision at first that any second operation is ever required : It is owing to a want of still greater boldness in the second operation, that a third is ever required ; and we know too well, how often a want of success in the third or fourth operation has tempted the surgeon to cut off the limb.

9. The sponge is often more useful than the needle, and often too in cases of the greatest danger. Wherever the wounded artery lies deep, and we cannot cut for it, on account of the nearness of some great artery or important nerve, as for example, about the neck or about the angle of the jaw ; wherever the bleeding artery is so nitched in betwixt two bones that we cannot draw it out with the tenaculum, nor reach it with our crooked needles, as for example, in the fore arm, or betwixt the bones of the leg : In short, wherever we cannot see the artery, or cannot strike it, (or strike at it safely) with the needle ; wherever the bleeding is not so much from a particular artery as from a general surface ; or wherever the blood is thought to flow rather from great veins than from arteries (as in tearing out cancerous glands from the

arrapit,) in all such cases we use the sponge, and we use it in the following manner.—We keep the sponge dry and hard compressed; cut it into small pieces, square or long, as the incision requires; tie small threads to them, by which they may be drawn away in due time; we choose out one piece, thrust it down to the bottom of the wound, settle it there with the point of the finger, either expressly upon the mouth of the bleeding artery, or, if that cannot be distinctly seen, upon the place at which the artery bleeds; then lay one compress above the sponge, a second compress above the first, a third above the second; and taking care to keep the compress always steady with one finger, we pile one above the other, till the whole rises so, above the level of the wound, that our bandage operates well upon the whole of this, which is called the graduated compress.

I advise you, on such occasions, to keep your tourniquet screwed during the whole operation, that you may not be troubled with blood; to slacken it slowly, that the dressings may not be discomposed by the too sudden return of blood; and still to let your tourniquet remain loose about the limb, and ready to be screwed if the artery should bleed again.

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OF OBLIQUE WOUNDS WHERE IT IS DIFFICULT TO FIND THE  
ARTERY.

BUT these rules belong, strictly, to clean and open wounds, while there are often oblique wounds of the smaller arteries, which are attended with peculiar difficulty and danger. It is an oblique wound only, that can produce any form of aneurism in the fore arm or leg; for in every wound of the wrist, the artery lies too superficially, and too open to create any real difficulty with a dexterous surgeon; but in an oblique wound of the arm, or fore arm for example, the blood does not escape freely, the arm is filled with blood, the flesh is soon corrupted, and the bone spoils; the disease, if allowed to go on thus, is a dangerous one,



and the operation, though begun even upon the very first day, is very difficult, for the artery is never found with ease.

In this matter, then, there are two things chiefly to be explained, viz. the difficulty of finding the artery, and the terrible consequences of the disease.

This difficulty of finding the artery is greater than it will be easy for you to conceive ; and I shall speak more fully upon this subject, that I may be able both to explain to you the difficulties, and, at the same time, to convince you of the natural dangers of such a case ; and especially, that I may impress strongly upon your minds the still greater dangers of ignorance, or timidity ; of this cruel lenity, (for it is called lenity) and of the folly of making incisions too small for the occasion, which, notwithstanding, are such as to produce all the pain of the greatest incision, yet at once protracting the operation, and making it imperfect. What case is more dangerous, or what operation more important than this of a wounded artery ? and where is the other great operation, in which our first incisions are done in this timorous way ? I should much rather, I am sure, cut up the axilla, to get at a wounded artery, than cut through the perineum and bladder, to extract a stone. The one indeed is the more terrible disease, but the other, as you will see by the following example, is a business of immediate life or death.

But yet before I enter upon the description of a case which I mean to state to you, I feel the necessity of explaining what I think is the import of the case ; and, in a few words, the business is this :—Sometimes an artery being struck with the point of a knife or sword, is merely punctured, and not cut across. The obliquity of such a wound acts like a valve upon the artery, there is but little blood poured out under the skin, and no remarkable tumor is formed : Now, the surgeon satisfied from the sudden and violent gush of blood, that an artery is opened, feels himself called upon to look for the bleeding vessel, and to cut up the arm or thigh ; but presuming too far upon his own knowledge of the arteries, he makes a new incision along the course of the artery, neglecting the more easy and natural way of seeking

for the wound in the artery, by enlarging the natural wound : And when, for example, the artery is wounded from the outside, he ventures to seek for it by a new incision from within. Thus he gets to that side of the artery, where no wound is ; his attempts to make it bleed only press the slit-like wound in the artery, down against the flesh below, so that he cannot see the wound, nor even believe that there is one ; he tries to make it bleed, but he fails ; still, he sees the main trunk of the artery lying in the bottom of the wound, beating strongly under his finger, apparently entire, and still he cannot believe that there is any wound in it ; he continues his work, but he can by no contrivance force it to bleed ; he can never see where the wound in the great trunk is, nor be satisfied whether or not the blood flows from some smaller artery ; but still in his absence it bursts out furiously, and bleeds so from time to time, till the patient expires. If I can show you one such case, it will be at once a lesson and warning to you ; and the warning will be just the more impressive, in proportion to the high name of the surgeon, who may have been guilty of such a mistake.

A young man of twenty-five years of age, in parrying a blow aimed, with a sharp pointed knife, at his breast, received it in the middle of his arm. The knife, in that position of the arm, entered at the outer edge of the biceps, and touched the Brachial Artery ; he staggered forwards a few paces, and then, fainting with the loss of blood, fell down. Unfortunately there was no one present but a young pupil in surgery, so ignorant that he bled him, and tied up the arm, putting merely a compress upon the wound.

Till the eighth day, there was no farther alarm, when a very slight cough brought on a violent bleeding, and then, fortunately, a surgeon was called, who really understood the dangerous nature of the case, and he, in his turn, called Mr. Duschamps, upon whom the care of the patient now devolved ; he found the arm enormously swelled, from the armpit to the elbow, and covered with echymosis down to the wrist.

“ At nine in the morning, says Mr. Duschamps, I began the

operation, the patient being seated, and every thing prepared. But, behold, when I introduced my probe into the wound, it passed so far upwards towards the axilla, that I feared the wound was very high, perhaps in the Axillary Artery itself ; so that, instead of the operation for aneurism, I might find myself obliged to amputate at the shoulder joint. I begged to have another surgeon joined in consultation, and accordingly Mr. Sabbattier met me in the evening at five o'clock. The operation was performed in the following manner."

Mr. Duschamps made an incision, not by enlarging the natural wound, but by a new cut along the inside of the arm, in the track of the humeral artery, full six inches long, extending downwards from the tendon of the pectoral muscle along the arm ; and by this incision, he penetrated into the aneurismal bag, and cleaned it thoroughly of coagulated blood. Mr. Duschamps and his assistants, then suspending the compression under the clavicle, hoped to see the wound, or at least to be directed to it by the bleeding ; but, though they examined and wrought a full quarter of an hour, and although they saw and felt the main trunk of the artery beating under their fingers, they could not, by any endeavours, make it discharge one drop of blood ; so that one of them ventured to say, he thought it could not be the main artery that was wounded ; while others agreed that nothing but a wound of the main artery could account for the first violent hæmorrhagy.

In this state of uncertainty, it was resolved to lay an occasional ligature under the artery, which, if necessary at any time, might be used, while the artery itself should be subdued, by compression alone with agaric, and dry lint \*. Mr. Duschamps, first enlarged

\* He is confused to the last degree in his account of the case, so that one cannot guess, whether he did or did not strike this occasional ligature through the skin and flesh, as the older surgeons did ; as Mr. O'Halloran was accustomed to do on difficult occasions, or as Mr. White did lately in Captain Mounsey's case ; but what makes one suspect that he did so is this, that he makes the following contrast of the two parts of his operation : We resolved, says Mr. Duschamps, to use on the *inside* of the wound, a compression extending along the course of the artery ; but beforehand, to put in an occasional ligature, " Dans cette incertitude, nous

a little the wound of the knife, and introduced his finger into it, pushed his finger upwards towards the axilla ; and by this dissection, was enabled to apply his occasional ligature half an inch higher than the point of his finger.

Secondly, He covered all the course of the artery, within the wound, with agaric and charpie, secured by an eighteen tailed bandage ; but so slightly bound, that it did not suppress the pulse.

At four in the morning the blood burst out, but it stopped again of its own accord ; it burst out twice the next day, and in like manner stopped again. On the third day it burst out yet again ; but the hæmorrhage which came on upon the fourth morning was frightful indeed : The bed was soaked through and through with blood, which, from the foulness of the dressings, had contracted a terrible smell. At ten in the morning, says Mr. Dufchamps, I reached my patient, and undid the bandages. The agaric and charpie were left in the incisions made with the scalpel ; the charpie was drawn out of the first wound which was made with the knife ; there was still no bleeding, and the patient was dressed as before.—Again at mid-day the blood burst out with amazing force, and again it was stopped by the attending pupil. Mr. Dufchamps now undid the dressings entirely ; cleaned the wound ; hoping to see the wound in the artery, or, at least the jet of blood, but not one drop flowed.—“ With a patient so exhausted,” says Mr. Dufchamps, “ I durst no longer trust to compression ; I now resolved to draw the occasional ligature, and the instant that it was drawn, the blood was thrown out with

resolument d'employer dans l'intérieur de la plaie une compression sur le trajet de l'artère, et préalablement de placer une ligature d'attente.” And next, he says, “ I passed this ligature half an inch above the place, which the point of my finger reached to within the wound ;” by which it is plain, that he was passing this ligature either through the skin, or through the wound he had made on the inside of the arm, and not the wound made with the knife, which he had now dilated no further than to admit his finger, and he introduced his finger for no other purpose, than to serve as a directory. “ Je pris le parti de choisir ce lieu pour celui de la ligature, que je fis cinq à six lignes au dessus de l'endroit où repousoit l'extrémité de mon doigt.”

force, proving very plainly that this ligature was below the place of the wound. I applied instantly a second ligature above the first, the blood was immediately stopped, and as immediately did the patient lose every degree of heat and of feeling in the limb." At this last operation of Mr. Duschamps, his patient had lost about three porringers of blood ; half an hour after he fainted ; in a few minutes he revived a little, but a thunder storm passing over them at that critical moment with some loud peals of thunder, affected him so much, that on the third hour after the operation he expired.

" Upon opening the body," says Duschamps, " we found the Brachial Artery wounded from the outside and from behind ; the wound was above the giving off of the Profunda Humeri ; small, punctured, made with the point of a knife just under the border of the great Pectoral Muscle ; the occasional ligature surrounded the artery immediately below the wound, and that ligature which had suppressed the bleeding was half an inch above."

These are all the circumstances of the case faithfully translated : But the manifold mistakes, though some of them are sufficiently obvious, are yet upon the whole so complicated one with another, and are, at the same time, so important, that I must force myself to explain them to you.

Was it not a weakness, to suppose this same Arteria Profunda to be absolutely essential in the preserving of the limb ? And yet this is an opinion which Mr. Duschamps declares in the most unequivocal terms. " Certain other means might perhaps have assisted me in securing the artery in this case ; although after all," says Mr. Duschamps, " the wound of the artery being above the going off of the Profunda, it was in vain to think of saving the arm ; but still if such means had but secured the artery and saved the patient's strength entire, we should have had in reserve the amputation at the shoulder as the last resource\*."

\* " Ce procédé m'auroit été de la plus grande utilité dans la première observation. La blessure de l'artère, à la vérité, étoit au dessus des artères profondes supérieurs, et par conséquent trop haute pour espérer de conserver le bras ; mais le malade alors



Was it not as great a weakness to think of succeeding by compresses, without the compression's being sufficiently firm to obliterate the artery? Mr. D. applied his compress and bandages so slackly, that they never affected the pulse; but had he conceived the true notion of obliterating the artery, and bound his compresses so as to have suppressed the pulse, the artery must instantly have been forced to bleed, and he would thus have discovered at his first dressing what he discovered too late, and only when he drew the occasional ligature, I mean the place of the wound.

Was it not a conceited and forward thing to trust thus to his knowledge of the artery, and to try to find it out by a new incision, while he might have been conducted exactly to the wounded point by the plain direction of that wound through which the knife had touched the artery? By this wilfulness, Mr. Duschamps looked upon the artery on the wrong side; he saw it only through his incision upon the inside of the arm, while it had been wounded by a blow which came to it through the upper and outer edge of the Biceps Muscle, *i. e.* from without. In short, when the man had been wounded from the outside of the arm, his surgeon looked for the wound from within, and the consequence was most natural, *viz.* that he felt the whole trunk of the artery beating strongly under his finger, but could procure no bleeding from it, and could not see the wound. It is a curious proof of a thing, which is proved to us also by other accidents (as the aneurism from bleeding,) that an artery wounded with a small and slit-like wound, though fairly wounded, yet will preserve its pulse, and will not bleed.

But when Mr. Duschamps found that his incision was too short, and that his operation was imperfectly done, or not at all, when he found his patient bleeding thus dangerously, why did he not exert himself? Why did he allow his patient to endure five successive bleedings without even undoing the dressings, when he ought absolutely to have cut open the arm? Surely I may say

*n'étant pas épuisé, il restoit la ressource de l'amputation dans l'article."*

thus much, when he himself says, that he had almost intended to cut it off.

His incision was made from the border of the Pectoral Muscle down along half the arm, and into the aneurismal sac. Now, his finger had been passed into the stab which the knife had made, and had not by a great way gone down into the bottom of that wound ; his ligature was placed no more than half an inch beyond the point of his finger, but still it was below the opening of the artery, as was proved during life by the repeated bleedings, and after death by dissection. Why then did he not go forward with his knife ? Why, when he knew the wound to be oblique, when he suspected it to be high, when he thought it was even in the Axillary artery, why did he not go forward into the Axilla ? Why should he have stopped at the border of the Pectoral Muscle ? or what is this pectoral Muscle that it should be respected more than the other muscles of the body ?

But, in the relation of this case, the last bold stroke, the only successful one is the most melancholy thing of all. It explains but too well what ought to have been done at first, and how successful it would have been, had it only been done in good time : for he cut open the arm, tied the artery fairly, prevented any farther loss of blood.

This idle incision on the wrong side of the arm, on the side opposite to the wounded point of the artery ; the long searching, without being able to see the artery, or to force out one drop of blood ; the absurd thought of suppressing this bleeding by compression, while the pulse at the wrist remained entire ; and the frequent bleedings and the final issue of the case ; and, most of all, the sudden falling down of the arm senseless and motionless, the moment that he drew his great ligature, including of course the artery, vein, and nerves, are the most decided marks of a bad operation, ill concerted and ill performed, and are lessons so important, as to make it a duty to criticise in these rude terms men even of the highest name ; and therefore it is that I choose thus to do my duty, and to bear the blame.

But even in this matter of delicacy, I mean to do something more, both to strengthen this lesson, and to exculpate myself. I will not leave it for any one to say, "This, after all, may be but one mistake of Mr. Duschamps, counterbalanced by many bold and well concerted operations." It is not so; and I proceed to prove, that if, as I think, he was wrong, he was habitually wrong; that these things were not done merely through the hurry and confusion of such a case, but that this way of cutting for the wounded artery at the wrong side of the limb, was his customary and settled practice.

A young man, a joiner by trade, 21 years of age, wounded himself with a pair of scissars in the thigh, with a wound flaunting from without inwards and backwards; the wound was about two thirds down the thigh; the blood flowed with great force, and the young man was carried to the great Hospital la Charité, in Paris, where Mr. Duschamps was first surgeon.\* The next day, says Mr. Duschamps, at 7 in the morning, I examined the thigh, found it slightly swelled, lifted the dressings, and, as soon as I lifted that piece of charpie which lay immediately upon the wound, the blood jetted out in a full arch, and the place of the stab, and the quantity of blood, left no doubt, as to its being a wound of the Femoral Artery, nor any question about the proper operation, which therefore was deferred no longer than till 11 o'clock."

In presence of Mr. Chopart, Boyer, and others, I then began the operation by passing a probe into the wound, and the direction of the wound, which it was not easy to pursue, carried the probe towards the Femoral Artery, and as nearly as I could guess, towards that point where the artery passes through the triceps muscle.

"Without minding this wound at all, I made a new one of six inches long in the track of the Femoral Artery, so directed, as

\* "Au tiers inférieur antérieur de la cuisse droite, avec un ciseau dit bédane, dont le tranchant étoit de dix lignes. Cet instrument pénétra de *devant* en *arrière*, et de *debors* en *dedans*, et ouvrit l'artère femorale."

that the wound of the artery itself, should most probably lie in the middle of this long cut. The integuments being thus opened, I dissected, through that muscle which immediately covered the artery, with all possible care ; till I distinctly felt the artery beating under my finger. As there was no extravasation of blood, and of course no cavity, it was impossible to lay the artery quite bare ; but yet I cut up to it, as closely as common prudence would allow of ; the artery, wounded from behind, presented no wound to me on this side, and, though we suspended the compression at the groin, not one drop of blood flowed, either from my incision, or from the wound : Once more, I introduced the probe into the wound of the scissars, and felt the end of the probe not naked indeed, but near the course of my incision ; with the point of my finger, I cleaned the parts, wrought with sponges, left the artery of the groin quite free ; but still, not one drop of blood issued from either wound\*.

Thus was Mr. Duschamps left in great confusion ; certain, by the direction of the wound, and by the bleeding, that the scissars had touched the Femoral Artery ; uncertain only where to apply his ligatures, or how :—perplexed moreover with the doubts of his assistants, who, not having seen the bleeding, and seeing and feeling now the strong beating of the artery, feeling also the entireness of the pulse below, could not believe that the

\* “ En présence de MM. Chopart, Boyer et autres, je procédai à l'opération de la manière suivante. J'introduisis une sonde dans la plaie ; sa direction, que j'eus de la peine à suivre, la conduisit vers l'artère femorale, à-peu-près à l'endroit où elle passe à travers le tendon du grand adducteur. *Sans avoir égard à cette plaie*, j'en fis une incision de la longueur de six à sept travers de doigts, sur le trajet de la femorale, de manière que le lieu où la blessure de l'artère pouvoit être supposée, se trouva dans le milieu de l'incision ; les tégumens ouverts, je pénétrai à travers le muscle qui couvre l'artère avec toutes les précautions nécessaires jusqu'à ce que son battement me fut sensible.

Comme il n'y avoit aucun épanchement sanguin, et par conséquent aucune cavité, il me fut impossible de mettre l'artère parfaitement à découvert. J'en approchai le plus près possible, et autant que la prudence pût me le permettre. Celle-ci, blessée à sa partie *postérieure*, ne me presentoit aucune ouverture.”

wound had touched the artery. They were also the more inclined to this opinion, from their not understanding what the blunder was which Mr. Duschamps had committed, (*viz.* cutting on the wrong side of the artery,) which made it difficult for the artery to bleed, and impossible for them to see it bleed, whether it was wounded or not.

Something they saw must be done, Mr. Duschamps therefore cut and dissected nearer and nearer to the artery, and came as close to it, as he safely could. The probe put into the wound of the scissars, seemed to touch the artery at the very point, where it passes through the triceps muscle; he therefore struck one ligature below the artery, half an inch under the passage through the triceps. By straitening this lower ligature in a temporary way the blood was stopped in the canal of the artery, and the artery was forced to bleed above; by this mark, the upper ligature was put also round the artery, higher than its wounded point, and the loop of this ligature being also tightened for a moment, by pushing the point of the finger under it, instantly suppressed that bleeding, which the tightening of the lower ligature had produced. Every thing being thus settled to the contentment of Mr. Duschamps, the ligatures were drawn close and tied, the bleeding was suppressed, the wounds were dressed lightly, and every thing went on well for seven days, the limb had recovered from the loss of its main artery, and what is always more doubtful, the artery itself continued secure. But on the seventh day, those secondary bleedings came on, by which so many patients have died, and it was after encountering great difficulties, after many burstings of the artery, after much loss of blood, and, of course, an irreparable injury to his constitution, that this young man was saved. In short, they saved, with great difficulty, a young man of a laborious profession, in the very prime of life; the arteries young, and in that flexible condition, in which we should have the best hopes of procuring a speedy adhesion, of making an uninterrupted cure!—This is a case, which presents this question strongly to us, Why should not the artery have kept



steady the very first tying, if it was possible to keep it steady in the end ?—But as I have passed already through all those rules, which direct the manner of securing any great artery, I refrain from mentioning many of the unfortunate accidents of this case, keeping plainly to the point in question.

It is sufficient to say, that Mr. Duschamps had made mistakes in the very beginning of this case, which never after could be put to rights : and all the frequent yieldings of the artery, and the terrible loss of blood, were owing merely to the artery being irregularly tied.

What business had Mr. Duschamps to trust so much to his own knowledge, or to make an incision in the course of the artery, when he might so easily have taken the plain direction of the wound ? Why should he have looked on the inside of the Femoral Artery, for the wound which had reached it from without, and which, he might have known, had touched the artery, only on its back part ? At the time when he might have seen his mistake, why did he continue cleaning and working on the inside of the limb, at the incision which he himself had made, when he might so easily have enlarged that wound, through which the point of the scissors had touched the artery ? Surely, if the wound was not on the fore part of the artery, where he was looking for it, it must have been behind ; why then did he continue dissecting, very dangerously and difficultly, upon a sound part of the artery, when he might have gone to the wound of the scissors, and dissected the artery at a place, where being already wounded, it would have been less unfortunate, even although he should have touched it again ? But what temptation, above all, had he to forsake the course of the natural wound, since he had seen, (when, with his own hand, he first lifted the dressings,) a high arch of blood thrown directly from that wound ? as Mr. Duschamps durst not make his dissection so clean, as absolutely to touch, or to surround, or to insulate the artery ; what had he to expect from the deep stroke of his aneurismal needle, with which he placed the ligature ? Nothing surely, but that it should sup-

prefs the bleeding only for the time, to burft out more furiously, when the flefh under the ligature faded, and more dangerously, fince it might burft out as fuddenly in the night, as during the day, perhaps after the attendants were exhausted with watching ; or when, by ufe and cuftom, they were grown carelefs and too fe-  
cure.

That the flacknefs of the ligature, was plainly owing to the fading of the parts, which were included along with the artery, is proved by the following paffage : “ When, on the evening of the feventh day, a violent hæmorrhagy came on, I lifted the dref-  
fing, and found the ligature fo relaxed, that it had no longer any purchafe upon the artery, having, in a great meafure, cut through the muscular flefh.”

Now, if the dreflings had been lifted, and the ligature found thus flackened twenty-four hours after the operation, I fhould have thought Mr. Dufchamps not far wrong in faying, “ for the ligature had cut through the muscular flefh ;” but when, on the 7th day, he finds this ligature flackened, and the muscular flefh gone, he fhould have faid rather, “ the muscular flefh under the ligature having gangrened, and being confumed, I found the ligature quite loofe\*.”

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OF OBLIQUE WOUNDS WHERE THE EXTRAVASATED BLOOD DE-  
STROYS THE TEXTURE OF THE PARTS.

BUT when an oblique wound touches an artery, where it lies deep under the flefhy bellies of many ftrong mufcles, or clofe be-  
twixt two bones, upon their interoffeous membrane, as in the arm or leg ; the cafe is ftill more diftreffing : A ball, we will fuppofe,

\* “ Je levai l'appareil ; à l'examen, je trouvai la ligature re-  
lachée, et telle qu'elle n'avoit plus aucune action fur l'artère, les  
parties mufculaires, comprises dans la ligature, étant en partie  
*coupées.*”

passes along the fore arm, rakes along the two bones, wounds the Radial or Ulnar Artery in the bottom of a deep and narrow wound, and then passes out beyond the elbow, making an opening too small to let out the blood ; or we will suppose the oblique stab of a knife, sword, or bayonet, touches an artery, lying thus in the heart of the fore arm, under all the muscles, and close upon the bone ; then the following consequences ensue. The profuse bleeding, at first, proves that some artery is wounded ; the direction of the wound should ascertain which artery it is ; the stopping of the outward bleeding causes an internal aneurism, different from the greater aneurisms of the arm or thigh, as it lies not under a fascia, forming a fair, circumscribed, aneurismal bag, but under the bellies of all the muscles, which are separated from the bones, by a very irregular and a very dangerous collection of blood ; the outward bleeding is soon stopped by compresses, and a bandage ; the friends are less alarmed, seeing nothing but a narrow flaunting wound ; but when the next morning, they see the arm black with the injected blood, and swelled to an enormous degree, their fear is like their indifference before, quite ignorant, and beyond the true measure ; they believe this to be an absolute gangrene, and that the patient is lost ; while the surgeon sees, in this blackness, not the signs of gangrene, but the marks of a wounded artery, and foresees a difficult and tedious operation of seeking it out. But if again the surgeon have not the skill to foresee all the dangers of the case, the apparent gangrene is soon changed into a real one ; the limb becomes cold, benumbed, and has a livid redness upon its surface ; the skin without runs into a low inflammation ; the blood within increasing every day, corrupts and bursts out ; and thus, as I have hinted before, it is not merely by the wound of its great artery, and by losing the great trunk that nourished it, that a limb is lost ; but in a case like this, it is lost by the deep driving of the blood among the flesh and bones. Either the outward bleeding is allowed, and the patient is in danger of immediate death, or the blood is confined, and the bleeding goes on within ; so that every time the artery bursts out,

the limb is injected anew, as it were, by the arteries, and is in imminent danger of gangrene at every new effusion of blood. The matter is bloody, fetid, corrupt ; it prevents the reunion of the bones, (if any bones be broken,) it makes foul suppurations, and extensive and fetid sores ; and each new suppuration is succeeded by a dissolution of those clots which had for a time stopped up the artery, so that again the blood bursts out ; till at length, after many months of suffering, the patient is forced to part with that limb which he has undergone so many dangers to preserve. The extensive sinuses, and foul sores, the disorder of the joints, and the total caries of the bones, make every such case incurable ; so that there is, even from the very first moment, no other alternative for the surgeon, than either to perform immediately a bold decisive operation, or to resolve at once (not keeping the patient in this lingering and cruel condition) to cut off the limb : and to the patient himself the questions may be honestly proposed in these terms : “ Will you have this tedious, but necessary operation, of tying the artery, regularly performed ? Or will you, to shun a present pain, linger for months in this miserable condition, consenting at last even to lose the limb, when it is perhaps too late to save your constitution, or even your life ? ”

This is the full description of that case, which I hinted at in the beginning of this discourse, when I said, that sometimes the arteries are wounded deep among the muscles, and there the blood corrupting the muscular flesh, and even spoiling the bones, is the occasion, after long suffering, of the patient’s losing often his limb, and sometimes his life : As the best examples of these dangers, I shall extract, for your use, the following instructive case from Mr. Allanson’s Book upon Amputation.\*

\* As one proof of the necessity of cutting boldly, observe what Gooch says, p. 341. “ Among the rest of our conversation at this time, there was mentioned a case, in which one of the arteries betwixt the tibia and fibula was opened about the middle of the leg, and the bleeding was stopped from time to time by various methods, but at last it was thought advisable to amputate the limb.” Mr. Gooch proposes rather to cut out two or three inches of the

Harry Knowland, a seaman, was wounded, in an engagement at sea, with a ball, which entered under the petella, broke the tibia and fibula, obliquely near their upper end, passed obliquely through the leg backwards, and a little downwards, and came out at the middle of the calf of the leg, followed by a great bleeding from the wounded arteries, and many splinters of bone.

A well instructed surgeon would have made a large and bold incision, laid open the wounded vessels, that he might tie them ; would have picked away all the looser splinters of bone, but he would have been careful, above all, in tying the arteries, knowing that, if they continued to bleed outwardly, the patient might die ; if inwardly, that they must inject the leg so strongly with blood, that it might fall into gangrene, and would, at all events, run into a foul and gangrenous suppuration. That the bones also, far from reuniting, would, in a few weeks, be thoroughly and irrecoverably diseased.

A fortnight after this wound, nothing having been done meanwhile to save his limb, this man was carried on shore and put into the Liverpool Infirmary, where he lay four entire months. At first his knee and the whole leg were greatly swelled ; the leg

fibula, and so expose the artery ; and I would add, that I should rather do any kind of operation, however cruel and tedious, than cut off the leg.

The imprudence of confining the blood, or of delaying the operation is well explained by the notes which our old Surgeon Wiseman gives us, of a case in which he was trying to cure a popliteal aneurism by astringents and by compression. He informs us, p. 122. " That while he endeavoured to keep the blood within the abscess, it insinuated itself between the muscles, making the calf of the leg hollow to the very tendon." This, we find, obliged him to make long incisions through the brawn of the leg, before he could accomplish the cure. In short, whether the artery requires to be tied, or whether the bleeding stop, we should neither confine the blood nor procrastinate our operation ; nor make our incision too small ; for the driving of the blood in this lesser, as in the greater aneurisms, disorders the soft parts, spoils the bones, puts the artery farther and farther out of our reach ; and makes the abscess extensive, the operation difficult, and the cure tedious ; small incisions also prevent the artery from being well seen and cleanly tied.



and foot cold and œdematous, with a very languid circulation through the whole limb : He had moreover a fever upon him, with a great depression and languor, a foul tongue, and a small quick pulse.

When the bullet holes were first dilated, there issued a great quantity of sanies highly fetid, mixed with clots and putrid blood. Bark and wine were used during this putrid or gangrenous state ; and free dilatations were made when the time arrived, for giving vent to the foul suppurations.

In the course of this tedious case, the callus often began to form, and they had hopes of accomplishing a cure ; but the deep seated hæmorrhagy continually returned upon him, coagulated blood was accumulated anew in every part of the limb, with a new discharge of putrid sanies, new sinuses, new suppurations ; and thus, from time to time, the incipient callus was destroyed.

Four months they struggled against these disappointments and difficulties, supporting him all along with diet and wine, often dilating the openings for the putrid sanies, sometimes extracting the splinters of bone, till at last such a bleeding came on, as put an end at once to all hopes of a cure. The whole limb was relaxed and swelled ; the cellular substance gorged with coagulated or putrid blood ; the hæmorrhage came deep from among the callus, from the very centre of the limb ; the man was quite emaciated ; his stomach was so enfeebled, that he could receive no solid food ; his health was already broken, and it was plainly imprudent to struggle longer, and impossible to save the limb. The limb was cut off.\*

The plain rule resulting from this case needs hardly be explained ; it is scarcely more than a recapitulation of that rule which

\* Upon injecting the amputated limb, the wound was found to be in the posterior tibial artery. It had been cut entirely across by the ball ; the upper end indeed had, by some accident, closed up ; and at the final hæmorrhagy, perhaps also at many of the former hæmorrhagies, the blood had come from the lower end of the wounded artery, it having returned freely by the anastomoses of the foot and leg.

has been already delivered : but it puts it in a stronger point of view, *viz.* that we should cut boldly ; seek freely for the artery ; tie it securely with the needle : and it is only where the artery can by no means be taken up with the needle, that you are at all to trust to the sponge, and even then, not willingly, nor without every precaution of firm compresses, tight bandage, a tourniquet to secure the patient from any deadly hæmorrhagy, and the appointing of attendants well accustomed to such a charge.

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## DISCOURSE V.

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### ON GUN-SHOT WOUNDS.

THERE seems to be a sort of mystery in the business of gun-shot wounds, which arises merely from the singular ideas which the older physicians entertained concerning the nature of shot. For gun-shot wounds are made by a blunt round body, which inflicts a deep and dangerous wound, and so bruises the surrounding flesh, that the wound is at first livid, soon becomes black, has little bleeding and no pain, soon falls into actual gangrene, and is extremely difficult to heal.

Here then are some strange peculiarities ; and it is excusable, or at least, it is not wonderful, that the older physicians, ignorant of the laws of the animal economy, and of the properties of the living body, should have agreed that there was something very particular in gun-shot wounds, which some, on account of the blackness, ascribed to the heat of the ball, and these supposed every gun-shot wound to be a burnt wound ; while others believed, that the powder was of a dangerous nature, and that a ball made of necessity a poisoned wound : There were others again, who being actually engaged in war, and as yet but little acquainted with fire-arms, believed that their enemies were so barbarous as to poison their balls. Parée tells us, that while the King of France was besieging Turin, the besiegers and the besieged mutually believed that their enemies had poisoned their balls, so cruel and untractable were the wounds ; but after the taking of the city the soldiers of both parties met, and then they saw that their own clean and unpoisoned balls had made the same cruel wounds. But besides, it often happens, that when a man is shot, he is overtaken with

an awful trembling and disorder of the nervous system, the bravest cannot resist it, and the most acute physiologist cannot tell whether it is a disorder of the body or a tumult of the mind. This too is peculiar, and served to confirm the common opinion, *viz.* that these were poisoned wounds. What indeed could more resemble the bite of a serpent or some poisoned wound, than an instant affection of all the body, a trembling and unaccountable sinking within, yellowness of the face, paleness of the extremities, a failing of the pulse, and a livid wound from which no blood was discharged.

I shall comment upon the true cause of these symptoms in the conclusion of this discourse ; but, in the meanwhile, it is natural to observe, that almost every doctrine has drawn after it some peculiar practice, good or bad, dangerous or useful ; and this pernicious doctrine of there being some kind of poison in a gun-shot wound, has been the root of all the harsh practices and cruel operations of the older surgeons : for, in order to subdue this poison, they made deep incisions, applied the actual cautery, burnt the wounds with turpentine or hot oils ; and the physicians, who took the direction in those days, would not in any circumstances allow the surgeons to bleed, lest the poison should thus be drawn back into the veins.

“ Our daily experience, says Barbetti, proves to us but too well, how possible it is to poison balls, and we can distinguish such poisoned wounds, by the vehement pain, livor, sudden blackness, and symptoms terrible quite beyond the nature of a common wound ; as burning heat, trembling, fainting ; while even the smallest poisoned wound, especially if neglected, or near the vital parts, brings present death. Bleeding or purging are dangerous, (for these draw the humours inwards) ; the poison may be extracted, by scarifications, by cupping-glasses, by drawing medicines, or, best of all, by the actual cautery : But to expel the poison, our chief internals are sudorifics and cordials \*.”

\* Quotidiana experientia globulos venenatos effici posse docet.

Vulnera venenata Glozis, sagittis, gladiis aliisque instrum-

This, which is, I believe, a fair and honest sample of the notions of the older surgeons, concerning poisoned and gun-shot wounds, is such miserable stuff, as I should think it needless to mention to you ; were it not, that hints like these, concerning the history of such matters, enlarge the mind, and set it free from prejudice, more than the most serious and laboured arguments could do, more than even experience itself. It is also such folly, as can be believed only by those who are acquainted with the absurd notions of the older physicians, concerning common wounds. The mysteries which they utter on those high occasions, involved in strange terms, are very amusing. The same Barbetti tells us, very gravely, “ that wounds of the lungs require comforting and drying medicines.” “ That spermaceti, though it heals the lungs, damages the brain\*.” “ That in a wound of the eye, the blood of cocks and pigeons, is very good ; but that the patient had better have nothing to do with eating bacon †.”

Parèe, a surgeon whom I have often taken pleasure in speaking of, was a man of extensive knowledge, and sterling good sense, and had the abilities and the courage to be a thorough reformer : and we find him continually warring against the mistakes and prejudices of the older surgeons. “ I have heard of nothing, says he, so often as of the poisoned nature of gun-shot wounds, and had read both in De Vigo, and in Guy De Chauliac, of the ways of burning them with boiling oils. When the

*tis, plus nocent vi venenata quam vulnere ; signa sunt dolor vehemens, color lividus mox niger, symptomata graviora præter rationem vulneris : In toto corpore ardor, tumor, delirium, lypothymia, &c. Vulnus etiam exiguum venenatum mortem afferre potest ; imprimis si loco cordi, aut parti alii nobiliori proximo extiterit ; curatio in hoc præcipue constitit ut VENENUM EXTRAHATUR, cucurbitulis, medicamentis extrahentibus, scarificatione aut, quod tutissimum, actuali cantereo, &c. Interne medicamenta profunt sordifica atque cardiaca nocent venæsectio et purgatio.*—PAULI BARBETTI, Chirurgia, Liber de Vuln. Venenat.

\* Spermaceti drachmæ dimidiæ pondere quotidie adsumptum in vulneribus pulmonum insigniter operatur, at cerebrum debilitat. P. 206.

† Sanguis turturi columbæ, galinæ, &c. conveniunt in vulnere oculorum, sed ab omni pingue abstinendum. P. 204.



French armies made their way into Piedmont, many of our soldiers, says Parèe, were wounded in the smaller garrisons : And I saw the army surgeons using their terrible cauteries, and I also followed the common practice, and dressed the wounded with boiling oils, until all my oils were expended. On the night on which this happened, I dressed my wounded soldiers with oil of roses, and turpentine, with whites of eggs. I went to bed much oppressed, with the apprehension that all these poor fellows would be found in the morning poisoned and dead. I arose therefore betimes, and learnt, to my infinite surprise and pleasure, that they had slept well and easy ; without any pain, or swelling, or redness about the wounds ; while those of my soldiers, who had been cauterized with the hot oils, had great fever, and swelling, and excruciating pain.” This fortunate accident determined Parèe in favour of the milder dressings, and was most probably the cause of all his future success. “ I have, says Parèe, been in my time chief surgeon to six warlike Kings of France, often in battles, and often shut up in besieged towns : for 30 years I have never used those burning oils, and I have never lost one patient, whose death could not be fairly accounted for by his bad habit, or by a contagious air !”

There is another curious anecdote, connected with this reformation of Parèe’s practice, which both shows the ignorance of the age he lived in, and demonstrates in a particular manner, that those among the cauterizing surgeons, who used milder dressings, were sure of acquiring a high name.

After the taking of Turin, Parèe insinuated himself into the good graces of a man, who had a high character for curing gun-shot wounds ; and having attended this surgeon, for two years, Parèe, when about to leave Turin, prevailed upon him to disclose this great secret. He made Parèe gather a pound of earthworms, and procure two living dogs, he infused the earthworms in white wine, and put the live dogs into boiling oils, till the flesh separated from the bones, then mixing them, he made a mild ointment, and this, he took a sacred oath, was the balsam with which he

performed such wonderful cures. The "oil of whelps," (for *Oleum Catellorum* is the name he gives it ; by which it was long known and much used by all the surgeons in Europe),—would make a strange figure in a Dispensary list ; but we find Parèe often prescribing the earthworms, and boiled whelps, as an excellent mild application for softening and bringing off the eschars, and for easing the wounds. No doubt this prescription, though ludicrous in some respects, was infinitely preferable to boiling oil. Parèe used it with great success, and the inventor of this foolish but mild ointment had got an established reputation by it ; Parèe recommended these mild dressings so effectually, that the chief surgeons of his time followed his example, and thus ended the practice of hot turpentine or boiling oils.

There are other prejudices of the present day, concerning the effects of a cannon ball, not less absurd than those older notions concerning the nature of gun-shot wounds : It is, for example, believed, that even the whiff and wind of a ball, will extinguish life. I have heard sensible men of our profession affirm it. We find Belguer, the famous Prussian surgeon, perfectly convinced of it ; and Tissot, in translating a book upon gun-shot wounds, sets himself gravely to prove by many laboured calculations, how intense the force must be of that air, which is pressed forwards by a cannon ball. This way of talking suits very well an ignorant midshipman, or the coarse boatswain of a man of war ; and many a good tale, no doubt, goes round in the cock-pit about this wind of a ball ; but it is unpleasant to observe men like Belguer talking so idly about this matter. Surely Belguer, of all people, might have known, that a man's right leg is often shot away, the breeches of the left thigh torn, and yet the thigh itself safe ; and surely he must have seen the arm torn from a man's body, while his body has yet remained unhurt ; how could a ball pass closer to the body, than in tearing off the arm ? and when can this wind of a ball be dangerous, if such a man escape ? Surely, Mr. Belguer must also have seen an officer's leg carried away by a shot, which had not hurt his horse, or a ball

carrying off a man's arm, while his fellow, who stood close up to him in the ranks, received no hurt.

Nay, still farther, cases stand upon record, from the very best authority, of soldiers whose arms had been carried away by the shoulder joint ; yet they suffered nothing but the loss of their arms, from which, also, they have recovered well.

But yet there is no report of this kind, however strange, which has not some meaning ; and the reason of all these wonderful tales about the wind of a ball, is itself very wonderful ; men often fall in the field of battle, and when the camp followers come to turn over the bodies, in burying their dead, no wound nor mark of injury is seen ; and often also, men are laid in the military hospitals, dying and unable to speak, upon whom there is found no kind of wound nor even the slightest bruise of the skin.

Now this apparent difficulty will disappear entirely, when I inform you, that often a limb is broken, while the skin remains unhurt, and a dreadful fracture it is : for when a great bullet strikes fairly, it knocks off the limb ; but when it strikes obliquely, it buffs along the skin, the ball is turned away, and the part struck, becomes insensible in the instant ; there is no feeling of the terrible accident that has happened, the patient is sensible of nothing more than a confused shock ; hardly knows where he is struck, and falls down. This fracture is of the worst kind ; for it is accompanied with such a bruising of the parts, that they never can be restored ; and though the skin is still entire, there is much blood extravasated, the muscles are in an instant reduced to a gelatinous and pulpy mass, the bones are broken, and the flesh, and the periosteum are to a great extent torn from the bone ; they are often so torn, that the limb cannot be preserved.

Let a ball hit any of the great cavities thus obliquely, and this phenomenon appears ; the patient is killed without any external wound. He is killed, according to the notion of his fellow soldiers, by the wind of some great ball : But we know that the ball has actually struck him, that the breast, the belly, or the head, has been hurt. If the chest has been struck, then the ribs have

perhaps yielded, and escaped the blow ; but the lungs have suffered, and often there is blood extravasated in the chest, which suffocates the lungs : in the belly there is often a bursting of the liver or spleen, without any outward wound of the skin ; very frequently in the head, though there appears no outward injury, the pericranium is separated from the skull, or there is an effusion of blood upon the brain. Nor is this piece of knowledge intirely without its use ; for extravasations of this kind, have been sometimes discovered by the pulse, and breathing, and have been relieved by making incision into the belly or chest.

Gun-shot wounds, then, are not poisoned wounds ; for no ball is poisoned on purpose, and, as for powder, it is so far from being hurtful, that it is often used by soldiers to wash their wounds with, or sprinkle upon their sores ; and often, as Magatus observes, when they are infected with venereal sores, they burn them with gunpowder ; nor are gunshot wounds burnt by the heat of the ball ; for if you fire your piece against a soft body, upon picking up the flattened ball you will not find it heated. Nor is there any such thing as an injury, much less death, arising from the wind of a ball ; but when a great ball hits a limb, obliquely, it breaks the bones, without injuring the skin ; and, of course, when a ball buffs along the surface of any great cavity, though the skin is left entire, the bowels within are hurt, the lungs or liver are burst, and the cavities of the abdomen or thorax being filled with blood, the person dies.

Without, therefore, any such childish representation, there is enough truly wonderful and dangerous in the nature of gun-shot wounds, to occupy our attention ; and these real accidents I shall now try to explain to you.

1. There is that trembling, fainting, and unaccountable fear, which comes over every man, the brave, and the dastardly, the strong, and the weak ; like the flutterings of a wounded bird, unaccompanied with any distinct sense of danger, and without the least degree of pain.

M. Le Dran, in speaking of this symptom, does not cover it with the delicacy, or rather cunning of Ravaton or La Motte ; he does not argue with them, that " this confusion cannot be the effect of fear in a nation noble minded and courageous to excess, and who often lying mortally wounded upon the field of battle, are heard encouraging their companions to fight bravely for their king and country." Le Dran deals more honestly. He had perhaps as high an esteem for the courage of his own countrymen ; but he knew that there was no need for boasting of that national courage which had been so often shown. Le Dran declares the plain fact, without any colouring or reserve : " From a principle," say he, " which nature has established in the human mind, it is, that as soon as one feels himself wounded by fire arms, he is struck with a panic and oppression too violent to be concealed. In that first moment of alarm, his reason gazes on nothing but danger, and there often follows a deprivation of almost every sense." And so regular is this symptom of trembling, fainting, and nervous affections, upon receiving a great wound, that the old physicians, who would account for every thing they saw, and who too often would see nothing, unless they could account for it, ascribed the trembling and disorder to that motion or trembling of the part, which was excited by the rapid motion of the ball.\*

Thus the first symptom, which follows a dangerous wound, is a trembling so sudden, so violent, so unaccountable to the wounded person, that it is at once a consequence and a cause of fear. There is a fluttering, oppression and fainting ; there is universal coldness and a trembling of the pulse ; there is a yellowness or a livid colour of the face ; and often, there is not confusion merely, but absolute insensibility, which continues during the scarification of the wound, or during the amputation of a limb ; and in

\* Mr. Belguer accounts for it by this concussion. Vide his marginal note, P. 57, and his text in P. 56. *Atque ea quidem universi corporis commotio ab aere externo qui a tormenti grandioris globe perniciosissime propulso provolutoque comprimitur, condensatur, celerrimeque agitur.*



one case the patient continued stiff and quite insensible to all that was done to him, till death.\*

2. A gun-shot wound, being formed by a round and bruising instrument, must have the appearance of one formed by a club, or any such blunt weapon, *i. e.* there will be a laceration rather than a clean cut, and there will be extravasated blood where the ball has struck, much disfiguring the lips of the wound; and thus the following appearances and changes succeed each other in the following order: The wound is black round the edges; this livid part falls into gangrene; the gangrenous parts fall off in a few days; and when these sloughs give way, a profuse bleeding very often comes on. These are the true peculiarities of the gun-shot wound. The extravasated blood makes it black or livid; the bruise of all the surrounding flesh occasions a superficial gangrene; the gangrene too often goes deeper than the surface, for all the surrounding parts are so much hurt by the shot that they gangrene almost as soon as they inflame; and the inflammation also of gun-shot wounds must often run very high, since there is a violent wound, that wound goes deep among the flesh, the opening is narrow, and there is often a foreign body, a ball, or pieces of cloth, lodged at the bottom of the wound.

3. Since a gun-shot wound is truly a bruise, begins with insensibility and ends with gangrene, the superficial gangrene or sloughing of the fores is the chief characteristic of gunshot wounds, and each of these accidents deserves notice, not merely on account of the peculiarity itself, but of the rule of practice which it draws along with it.

As for the trembling, coldness, and the change of countenance, though it would lead one to apprehend that some of the viscera or some great artery were wounded, it is no sign of danger, but goes off in a few hours, and, as after the cold fit of an ague, an intense fever succeeds. If any thing be required, it is only an opiate or a cordial.

\* Vide Mr. Quesnoy's Essay on Gangrene.

The narrowness of the orifice, and the ecchymosis or bruised appearance of the wound, are the great peculiarities of a gun-shot wound. "No gun-shot wound heals by adhesion;" every gun-shot wound suppurates, or, in other terms, inflames. To make that inflammation easy, and to relieve the stricture of the narrow opening, we scarify or open up with the scalpel both the mouths of a gun-shot wound.

The sloughing is caused by the bruise; the bruise deadens the parts, so that they feel no pain; while they feel no pain, they pour out no blood; but on the eighth, tenth, or fifteenth day, the wound is inflamed; the active vessels now throw off the dead parts; this discharge of the slough throws all the vessels open, and thus the vessels, which had not bled, burst out upon the eighth or tenth day: And there, of course, follows a caution of the utmost importance, that it is the nature of a gun-shot wound, to bleed little, at the time the wound is inflicted, but to burst out suddenly, and to bleed furiously, at the falling off of the eschar, that is, on the eighth, tenth, or fifteenth, days; at that time, it must be watched with the utmost care, for the blood often bursts out during the night, and in the morning the patient is found dead, bathed in his blood.

Thus the mystery of gun-shot wounds vanishes, when we construe all their appearances into the common operations of the economy; it is not because they are poisoned or burnt, that they are thus malignant; but it is because they are bruised, that they gangrene; it is because they do not at first bleed, that their after bleeding is so dangerous; it is because they are deep, penetrating, and ecchymosed, *i. e.* bruised, that they appear malignant, and do not easily heal.

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## DISCOURSE VI.

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### ON GUN-SHOT WOUNDS.

IN my last discourse, I explained to you the peculiar nature of gun-shot wounds. "I observed that it is not because they are poisoned or burnt, that they show their malignant nature ; but it is because they are bruised, that they gangrene ; it is because they do not bleed at first, that their after bleeding is so dangerous ; it is because they are deep, penetrating, and bruised, that they appear malignant, and do not easily heal." In these short definitions, are pretty accurately marked the chief peculiarities of gun-shot wounds ; and their peculiar nature draws after it a peculiar practice ; for it is to open this narrow wound, to unload the pent up vessels, and to quicken the falling off of the bruised parts, that we sometimes scarify those wounds ; this scarifying converts such a wound in some degree, from its peculiar nature as a gun-shot wound, to that of a fresh, open, and bleeding wound. Thus the motives for this practice, are laid down in a general way ; and, taking this for my text, I shall proceed to branch out this practice of scarifying, and probing, into all its operations.

1<sup>st</sup>, I shall explain to you, how you are to examine a gun-shot wound ; how to guess at its direction, to prognosticate its event, to declare whether any of the viscera, or any great vessel or nerve, be wounded.

2<sup>dly</sup>, I shall teach you how to scarify a gun-shot wound, so as to open its vessels, loosen the bruised parts, and leave a free opening, as a drain for the matter, or for the extraction of the ball.

3<sup>dly</sup>, I shall just put you in mind of avoiding the arteries, or tying them when cut ; and,

*4thly*, I shall give rules for the extraction of balls, cloth, splinters of bone, or of any foreign bodies, which might prevent the healing of the wound.

I know very well that these heads of discourse will seem very short, and that you will think they might be easily delivered, almost in the direct and plain form of practical rules. But in truth, the details which fall under these four heads, contain the whole practice ; and, in order to instruct you thoroughly, I must first teach you by lesser directions, many of which must go to make up a great rule. But rules of practice are so satisfactory to the young surgeon, so easy to be remembered, and keep the judgment so clear, that, in a matter like this, I shall be careful, first, to instruct you in all these minutiae of practice, and then to collect these particular directions, into general and formal rules.

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#### 1. OF EXAMINING GUN-SHOT WOUNDS.

No sooner does the surgeon see his wounded soldiers carried into his tent, than the very sight of a man, pale, and perhaps bleeding, awakens the strongest interest, and a lively anxiety, to know the nature of his wound ; but how much stronger must the patient's own feelings be, who waits in awful suspense, while he learns even from the countenance of his surgeon, the sentence of life or death !

A surgeon of experience no sooner casts his eyes upon his patient, or feels his pulse, or puts his finger into the wound, than he has some presentiment of the event. But suppressing all hasty conclusions, which are so often corrected by reflection, he begins to examine his condition more deliberately. He observes, first of all, the trembling, fainting, stupor, and paleness ; but this agitation of the system, he knows to be natural, and that it is no cause for apprehension ; he knows that it will go off by composeure, cordials, and rest. Then, if the wound be near the belly or

breast, he observes the breathing, and feels the pulse ; for it is by these, that he guesses whether it be a dangerous wound. If with a wound of the breast there be great oppression of breathing, and the pulse fluttering, interrupted, or very weak, but more especially, if there be a blast of air from the lungs, there must be danger. If, from a wound of the belly, there be lowness and insensibility, frequent fainting, a weak pulse, and the extremities cold, then some great vein or artery is wounded ; there is a bleeding within ; the belly swells, the breathing is oppressed, the faintings increase, and, how long soever life may be suspended with such a wound, the patient must die.

There is nothing in which good sense, and a correct judgment, and above all a humane temper, may be more particularly displayed, than in this of probing wounds : To a man of skill, and real knowledge, in anatomy, the direction of the ball will of itself declare the danger ; the symptoms will confirm that terrible sentence, which he has secretly conceived ; and, seeing what is likely to happen, his good sense and feeling will restrain him from making inquiries, which must give the patient alarm and pain, and which cannot relieve nor save him. How opposite to this modest conduct, is the temper of those, who, with a suppliant vanity, will introduce their probes among the viscera of the breast or abdomen, where they never should be ; from the contemptible desire of exalting their own little character, by pronouncing their opinion over a dying man ? Turning their dying patients, says Ravaton, with what I would call a cruel ingenuity, into the particular posture, in which they happened to receive their wounds, declaring, with great pomp, that the wound is in the stomach, the liver, or the lungs ; while it is plain, that such opinion has no influence on our practice, nor any relation to the patient's safety. Surely no such idle thoughts should be indulged ; perhaps a surgeon might be hurried into this folly, by the anxiety of friends, inquiring with eager haste, whether the patient were safe, and seeming to make the prognostic their test of the surgeon's skill. But a surgeon seeing his patient's danger, and knowing that it



would cause more danger, and put him to needless pain, were he to search his wounds ; should be ready to set a guard upon his own actions, and forego a little momentary reputation, for his patient's safety : and yet, after all, it is perhaps no sacrifice ; for faithful and good conduct, which brings the truest reputation, is distinguished even by the ignorant in the end.

Our surgeon Ranby agrees with La Faye and Ravaton, in refraining from using the probe, in wounds of the belly or breast ; “ for thrusting the probe down into these cavities, is, at every repetition of such practice, a fresh stab \*.” This practice seems to have gone as much against his feelings, as against his judgment ; for he says, “ I never could bear the thoughts of thrusting a long pair of forceps, the Lord knows where, without any probability of success †.”

But, to pass over authorities, the plain reason for not probing too curiously in wounds of the liver, lungs, bowels, or other internal parts, is, that our conduct is nothing affected by it ; after such a wound, we lay the patient quietly in bed, there to take his fate ; we wait for symptoms, and judge by them of his condition : It is only by the course of the symptoms, that we are regulated in our practice, and not by an apparent danger in the wound ; we find it is better for our patient, it is even safer for our own reputation, (if thoughts concerning it are to be allowed), to refrain from these useless searchings ; for wounds are often really dangerous when we believe them safe, and still more frequently, it happens, that we believe them dangerous when they heal without one bad sign.

This lesson cannot be better enforced, than as it was delivered by La Motte, to a surgeon who showed himself too well prepared to do something, before he could tell what needed to be done. It was in the case of a young gentleman, who had been wounded with a rapier, quite across the belly, from side to side ; his surgeon had provided abundance of probes, scissars, needles, and knives, of all kinds ; but La Motte, taking the privilege of an old

inafter in surgery, told him calmly, that there was no need for all that frightful armoury ; the course of this weapon, says he, is but too plain, and, if the bowels be really wounded, I fear we shall know it but too soon. Accordingly, La Motte was resolute in doing nothing ; he laid a piece of lint upon each wound, bled the young man freely, and, in eight days, he was walking in the streets. Here was displayed the superior discretion and good sense of an old and skilful surgeon ; and, I think I use the right word, when I say, that La Motte was resolute in doing nothing ; for, had this wound been committed to the surgeon, with all his probes, you may guess shrewdly, that at least, he would not, at the end of eight days, have been in the streets. Your business then is to observe the direction of the ball, to reflect upon its course among the viscera, to calculate, for your own private satisfaction, which of the viscera may be wounded ; but never be so rash as to pronounce an opinion on this uncertain point, either to the wounded man, or to his friends. You observe your patient's condition most anxiously, his breathing, his pulse, the seat of his pain ; perhaps also you push your finger slowly and gently into the wound ; to examine more into a wound of this nature, and especially, to thrust your probes down into it, were neither humane, nor sensible, and surely were no mark of superior skill in the surgeon, who could think it necessary to do so harsh and hurtful a thing.

But, although in wounds of the belly or breast you need hardly examine the wound, since you cannot follow the ball, you should, in wounds of the limbs, examine accurately, for there much good is to be done ; there is a direct motive ; there is the hope of finding the ball, and the expectation of cutting it out : This encourages us, in spite of any pain which the patient suffers ; for probing is comparatively easy at first. When a man is recently wounded, the parts are deadened, the wound itself is so bruised, that it is, (if I may be allowed to call it so), a hollow gangrene ; the wound, being as a tube lined with dead parts, feels

little at that time ; but when it has inflamed, it is swelled, and the finger cannot pass, it is painful, and we dare not persevere. We do not cut a corn when it has inflamed, much less can we tease a gun-shot wound ; and besides, the patient in the heat of battle can look coolly upon any bloody operation, which after five days he cannot bear the thought of : Therefore, all probing should be done at the time of the wound. If the patient has lain in the field, or been dragged in carriages after a retreating army, till his wounds are inflamed, and is received into a hospital in that condition, he must be wrapt up in poultices till the eschars have fallen, and till the swelling be gone ; and when the wounds have suppurated, and come into a soft and easy condition, we may again probe the wound.

All surgeons prefer the finger to the probe ; because a musket wound will admit the finger easily, the finger is not apt to catch upon tendons or nerves, it does not endanger the arteries, and by feeling with the finger, we judge most accurately of the condition of the wound : The finger both directs our operations, and instructs us in what is to be done. Perhaps we feel the ball, and then we cut directly upon it ; perhaps we feel the wound making a crooked or spiral turn, and we follow it with our incisions ; perhaps we are sensible that it touches a great artery, and in working with our bistoury, we are careful of that artery ; we know also whether the ball has touched a joint, or broken any bone ; accidents, which not only increase the danger, but which may even incline us in certain circumstances to cut off the limb. In short, all that we resolve, is from the information that we have through the finger, and it directs all our operations : The finger is always in wounds of the limbs, but more especially in wounds of the viscera, to be preferred to the probe.

By these observations, then, you will learn to be prudent and gentle in probing dangerous wounds, as of the breast and abdomen, and slow in declaring your opinion : But you will be more bold and persevering in probing wounds of the limbs ; because the wounding of the joint, or the shattering of the bones, may, along

with other considerations, incline you to amputate the limb ; or the ball having cut the great artery, may be another reason why the limb cannot be saved ; and the extracting of the ball itself, or of the broken bones, depends upon your feeling them. Thus, your future operations are regulated by your opinion of the wound, and the first of these operations is the scarification of the wound.

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## 2. OF SCARIFYING AND DILATING GUN-SHOT WOUNDS.

Mr. Hunter reasons thus about the dilating of wounds : “ Surgeons first dilated wounds, because of there being foreign bodies in them which it was necessary to extract ; and they continue this practice of dilating wounds, although it is very well known that balls remaining in wounds produce so little danger that a modern surgeon would not allow himself to give pain, nor to make a large incision merely for the extracting of the ball ;” yet they altered this practice, says Mr. Hunter, “ only in so far as respected the attempt to extract extraneous bodies ; for when they found, from experience, that it was not necessary nor possible to extract these immediately, yet they did not see that it therefore was not necessary to take the previous or leading steps towards it.” In short, Mr. Hunter thinks that a useless practice is continued, after the intention of it, *viz.* the extracting of the ball, is no longer acknowledged. But I am persuaded that, were we but to look a little farther back into the history of this practice of dilating wounds, we should find the surgeon driven from one foolish reason to another, in vindication of a practice which he still found necessary, and still could not explain. In short, in this as on many other occasions, the practice continues the same, while the theory changes according to the caprice of the author.

When army surgeons could no longer assign the poisoned nature of the wound as their motive for dilating it, they found themselves still obliged to continue the practice of dilating wounds ; and on

one memorable occasion, we find the congregated colleges of surgeons and physicians assigning a very curious reason for their practice.

The Baron De Sirot who had been lieutenant-general of the camps and armies of France, under three successive kings, Henry IV. Louis XIII. and Louis XIV. was wounded in the thigh with a musket ball, which broke the bone ; and he was a man so much valued, that the Queen gave a particular order for both colleges of surgeons and physicians to consult and advise upon the case. Four members from each college were deputed to examine the case, while the colleges waited each in their own hall to receive the reports. There was, no doubt, in a meeting of two colleges some little disagreement : but the majority determined to make incisions “ to give air to the wound ;” or in plain terms, they found great collections of matter, and they knew by experience that the incisions prevented or allayed the swelling, by “ giving vent or giving air to the wound.”

The purposes of scarifying are, I have told you, to open the vessels, that they may bleed ; to enlarge the wound, that when it inflames, it may have room to swell ; and your incisions, while they change in some degree, the nature of the wound, enable you to see to the bottom, and to take up the bleeding arteries, and to extract the ball, or the fractured bones.

In this first sentence, I have mentioned all the motives for dilating these wounds ; and you will naturally observe, that of these motives, a bleeding artery, a broken bone, or foreign bodies lying at the bottom of the wound, belong to the common principles of surgery ; but that, independently of these reasons, there are direct motives for this particular practice, which I shall endeavour to explain in such simple terms, as to enable you to draw a plain inference, judging for yourselves.

The meaning of this expression, of giving vent to the wound, is to be found in the following description of a deep wound in a fleshy member. Every recent wound admits the finger of the surgeon ; but when, after a little while, the wound in the skin inflames, we cannot push in our finger, but with force, and with



pain ; and when we do force our finger through the ring, or stricture of the outward wound, we feel plainly that all is loose, soft, and easy within. This stricture, then, or inflamed ring of the skin, with a deep wound, which swells and inflames, should, when we are sensible of such stricture, induce us to open or dilate the mouth of the wound ; and it is very singular, that army surgeons should, with one accord, direct us to open very freely every gun-shot wound ; while none but those surgeons, who have seen few gun-shot wounds, venture to talk of reducing this piece of surgery to the common principles, which regulate our practice in other wounds. Here it is easy to see, which party we ought to follow, and we must continue dilating gun-shot wounds, till the army surgeons shall reject this rule of practice, which they introduced, and still follow, and which they alone are entitled to annul.

Every man is too apt to represent his own conceits as the true PRINCIPLES ; and whether he is settling disputed points in surgery, or debating some higher question in science, still this word PRINCIPLE, is apt to be abused. But surely, it is consonant with all sound principles of surgery, (at least, in so far as surgery is in any degree perfect), that we should open every wound which has bleeding arteries, or broken bones, or where foreign bodies are lodged within it ; and most especially, it is good surgery to open every wound, which is of a tubular form, *i. e.* which is deep and penetrating, with a narrow opening, a tense fascia over it, and an inflamed skin, and which must itself inflame through its whole extent : were this, which we are now treating of, a penetrating wound, inflicted by a sharp or clean cutting weapon, it might adhere, even by the first intention ; and we should rather cover the mouth, and press together the sides of such a wound. But gun-shot wounds must throw off sloughs, cannot heal by adhesion, must suppurate, or in other terms inflame ; and so we return to the first point, “ that it is to make this inevitable inflammation more easy, that we make a small longitudinal incision, so as to widen the mouth of such a wound \*”

\* Mr. Hunter says, “ open or scarify a wound as freely as you

The second motive for dilating a gun-shot wound at once strengthens the general argument and teaches us to carry the incision a little deeper than the skin : for, since the penetrating gun-shot wound, which passes through the thick flesh of a limb, must inflame through all its course, it is very plain that, while it inflames it swells, and when it swells, the fascia, which only bound the muscle in the just degree before, must straiten and press them. From this straitening proceeds a corded feeling of the wounded limb, a higher inflammation, a crampish pain, convulsive twitchings of the limb, sometimes locked jaw, and sometimes death. From the anxiety with which Ravaton and Le Dran direct us to cut this tense fascia with a large crucial incision, we are sure that they had just such ideas, and such motives as these, for their practice ; but those who are harping always upon the old string of principles, shall also be satisfied that this practice belongs fairly to the surgery of common wounds, and *a fortiori*, in a particular manner to gun-shot wounds.

A young woman, a servant in the country, had a fall from a cart, and by her elbow lighting upon a sharp stone, she received an angular wound by which the skin and the fascia were torn. This lacerated wound was about an inch in length, and the fascia, at this point of the arm where it is strongest, was so lacerated, that its ragged edges projected through the wound. There came on a deep coloured inflammation, accompanied with a deep-seated dreadful pain of the whole arm : She had restless nights, fearful dreams, weakening sweats ; she could not move her arm,

may think necessary, I will engage, that it will be, in a month's time, in the same state with a similar wound which has not been opened ;" which argument is a very unfortunate one on Mr. Hunter's part ; for it proves this plainly, that whatever good such scarifications may do, at least, they will do no harm ; they may save the patient from pain, from high inflammation, or from nervous symptoms, such as often follow an inflamed fascia in bleeding of the arm ; and that till "the wound will be in a month as nearly healed, as if it had not been opened ;" in short, the quick healing of this scarified wound is so particular, as to be observed, even by those who are the most averse from this practice of scarifying wounds.

nor suffer it to be moved ; her distress was continually increasing for ten days, when she seemed in great danger of her life. The surgeon then ventured to make an incision through the skin and fascia two inches long : The fascia instantly flew open ; all the dangerous symptoms were at once removed ; and next day, instead of the gleety discharge which had hitherto come from the wound, there came good pus, and the whole wound and incision healed quickly, leaving only a degree of weakness behind. In this, and in similar cases, the fascia flies open with an impetus which shows its tension, and with such instant relief of pain, as demonstrates in a manner the necessity and the good effects of the incision. The analogy here is very direct and fair ; it might be strengthened with numberless cases of the same nature more prolix indeed in their detail, but not more decisive with regard to the great point at issue ; and, among these, there is one case which stands out very prominent from all the rest, where the fascia was four times divided, always with perfect relief, but always as the fascia healed, the contraction of the arm, the spasmodic disease of the whole system, the restless nights, fearful dreams, pain, fever, and weakness returned ; till at last, by a random stroke, rather than by any well conceived design of the surgeon, the fascia was fairly cut across at the place where it is braced down by its connection with the long tendon of the Biceps Muscle, and then only, *viz.* at the fourth incision, the patient was entirely relieved. “ Now, says she, you have indeed cut the cord which bound my arm ;” and she tossed her arm freely, and with great exultation. In short, this is a case on which I would insist much ; for if I could afford time to detail at full length the circumstances of it, you would find these four successive operations to resemble rather four regular experiments contrived for the very purpose of proving how dreadful the distress arising from a tense fascia is, and how sure the relief is every time that the fascia is opened, and how surely the distress returns every time that the fascia is allowed to close ; and how perfect the relief is whenever the fascia is decidedly and fairly cut across. In short, with such analogies be-

fore him, no surgeon, however averse from the dilatation of gun-shot wounds, can refuse his assent to this second rule, "that, wherever we dilate the mouth of a gun-shot wound, the incision should pass through the fascia, as well as through the skin;" and that, whenever the symptoms of a tight fascia come on, we should be careful to open the wound anew, and to make the fascia quite free.

These incisions are not severe; the very purpose of them is to abate inflammation; they are done early when the wound is almost insensible, the patient feels little pain in the present time, and owes to these incisions much of his future comfort and ease; we are particularly well assured, that they do not retard the healing of the wound, "which is as far advanced in a month, as if it had not been touched with a knife;" in short, though the wound will often heal without scarifying, yet here, as in every other necessary operation, the patient has a chance of escaping much pain and danger, by submitting, in the first instance, to a trifling pain, attended with no danger, nor any consequences but what are good.

Thus, you perceive, that the first great point to be established, is the propriety of scarifying those wounds, in which the tension of the fascia, the swelling and tension of the limb, the confinement of the matter, or the manifest constriction of the orifice, make it necessary to give this relief; and as for the dilatation of those wounds, in which there is a bleeding artery, shattered bones, or some foreign body remaining within the wound, that is a business too plain to need argument; and therefore supposing the principle to be acknowledged, I shall next proceed to represent the practice; the subjects, therefore, which remain to be explained, are the intention of counter openings; the use of setons, the extraction of balls, or of splinters of bone, and the way in which we manage the bleedings from gun-shot wounds.

1<sup>st</sup>, A COUNTER OPENING, is the opening which the ball itself makes behind in passing through a limb; or that which the surgeon makes for the extraction of the ball, when it has not passed

quite through and through.—The greatest army surgeons, who were also, it should be remembered, the most eminent private surgeons in the greatest cities of the world, have advised us always to make a counter opening, and extract the ball ; they order this in the most direct terms, where the ball is near, or directly under the skin. Some of the most famous surgeons advise, that we should extract the ball by a counter opening, even when it has passed only two thirds through the limb. Mr. John Hunter, alone, disapproves of this : He says, that it will raise a high inflammation, passing along the whole canal of the wound. He advises that we refrain from this opening, till we have first healed the gun-shot wound, and then, we may, without danger, make our incision to extract the ball. But the answer is plainly this, that the inflammation of a gun-shot wound very seldom runs to any dangerous height, except from a ball bruising the limb, or from broken bones ; the anxiety of the patient to have his ball cut out, is so great, that this, of itself, is some motive ; he may be gratified in this point with no danger, and with little pain : Army surgeons continue this practice, and unless Mr. Hunter had been the greatest army surgeon, as surely he was one of the most eminent surgeons in private life, his hypothesis, put in competition with their practice, must not stand.

But there is also another kind of counter opening, which the surgeon is at times obliged to practise ; I mean the opening which he must make in the middle of a long wound, when the track of the wound swells, or when the abscess forms, and the matter, the sloughs, and the foul ichor seem to be confined.

For example, a man is wounded by a ball, which breaks one or two of the fingers, pierces the hand, runs up the fore arm, rakes along the bones, and goes out far from its entrance, as at the elbow, or at the shoulder joint : Here we can hardly prevent a long suppuration, and too often, an exfoliation or spoiling of the bones ; and three openings are required, one where the ball entered, another at the counter opening, or that by which the ball passed out ; and if swelling, pain, irritation, or perhaps nervous



symptoms come on, then there will be required also another opening in the middle of the wound. Such an opening will ease the swelling, and prevent a suffocation, (if I may express it so,) of the wound; it will prevent gangrene, bring on a good suppuration, and allow a free vent for the matter; it will also prevent sinuses, and so save the arm, which, from frequent collections of matter along the course of a long bone, must be in some danger; and there is one good effect of such an incision, that it will save us from the severe, or rather cruel practice of the older surgeons, who were accustomed, in such cases, to run a large seton through the tube of the longest wound.

2dly. The *true use of a seton*, falls next to be discussed; for, though the indiscriminate use of setons must be condemned, we must acknowledge certain circumstances in which they should be used; but not as the older surgeons used them. It is manifest, say those older surgeons, that setons will give free admission to our medicines, will preserve a free drain for the matter, will encourage the suppuration, and will shake the fractured bones. Now, as for the medicines that are to be introduced, we know of none which can be useful; the matter surely will make way for itself; setons will, no doubt, promote suppuration, and support it! but they will do so just in the same way, that a ball sticking at the bottom of the wound, or a piece of the soldier's coat or vest, will encourage suppuration, *i. e.* by irritation and pain, attended often with so high a swelling, that the seton must be suddenly withdrawn.

But when I say, that "this severe or rather cruel practice," I mean only the running up of a seton through a fresh wound, where the expectation of its quickening the fall of the sloughs is no apology for this needless pain. In the first moment of the wound, it is not unusual, with a long probe, to draw through the tube of the wound a skein of cotton, which, if there be any piece of cloth, or splinters of bone, or balls, it will sometimes entangle them, and draw them out, so as to prevent tedious suppurations and sinous ulcers. But there is no motive for keeping the

cord in any recent wound, accompanied with irritation and pain, and a rising inflammation ; this cord is therefore immediately withdrawn ; but there is an after-stage, in which this long wound, having become fistulous, and of a callous hardness through its whole length, will not heal.—And this slow cure may be attributed to one or other of these two causes.—First, that the wound, having become entirely callous, pours out a profuse, gleety discharge ; its vessels permitting their fluids to escape thus, through mere relaxation, while they are incapable of that degree of inflammatory action by which the wound should heal.—Secondly, That there may remain some foreign body within the wound : Now a ball never produces these symptoms ; a broken and corrupted bone would presently be known by the black colour and fetid smell of the discharge ; and if the slow healing of the wound is known to proceed from neither of these causes, then most likely it arises from some piece of cloth which has passed in along with the ball ; and though sometimes we may excite such a wound as this, by stimulant injections, or wash out any piece of cloth by milder injections of tepid water ; yet clearly the best way of exciting a healthy action in such a fistulous sore, or of entangling any foreign body, is to run a seton through the wound, to draw it for a few days ; if, in that time, it either does harm, or does no good, let it be withdrawn ; and if the wound be truly callous, and really requires this harsh treatment, it will also be able to bear it without either danger or pain.\*

\* However useful, or rather allowable, setons may be in flesh-wounds, I cannot think them prudent or harmless, in cases where there are broken bones or a wounded joint ; for there the inflammation is apt to run too high, and the suppurations are but too profuse ; and I protest, absolutely, against the setons being run across the cavities of the thorax or abdomen ; yet it is in such cases, chiefly, that tents and setons have been used ; and therefore I shall need to take up this question, again, when speaking of wounds in the breast.

### 3. OF THE EXTRACTION OF BALLS, CLOTH, OR SPLINTERS OF BONE.

THE endeavours which you make for extracting the ball, must be infinitely varied, according to the circumstances of the case ; and there can be given hardly any more specific direction than this one, to use your finger more than forceps, and to get the ball out, rather by making free incisions, so as to touch it, than by painful and ineffectual gropings in a deep and narrow wound ; for forceps are not quite safe, and screws are very dangerous, and not to be used : You must have crow's bill and crane's bill forceps of various forms ; and often by pointing with the finger, you can make them touch the ball, before opening them to grasp it ; but you must not use those foolish screws, called *TIREBALLS*, which are only to be passed deep into the wound, where the finger cannot go to guide them ; and which, you may be assured, are as likely to be fixed into the bone as into the ball, although no doubt the ball is generally flattened by striking the bone. As for the *DILATORS*, they belong to the armoury of the old surgeons ; for they were used for dilating, or to speak plainly, for tearing the wounds open, in the times before *Parce*, when not being able to take up an artery, the surgeons never dilated with the knife, nor ever used the knife, even upon the most necessary occasions, but with fear and trembling, and with their cauterizing irons ready to fear the arteries with, before any operation was begun.

If a ball have passed quite through a limb, it is well ; if it have passed nearly through, but stopt at the skin, (which is very tough), then the counter opening takes it out ; if the ball has passed more than two thirds through the limb, it will still be easier to take it out by a counter opening, than to seek for it with forceps at so great a depth ; or rather, perhaps, it should be left. If a ball be stopt by a bone, it may have spent its force, and may have been flattened slightly without breaking much of the bone ; then it is to be got away with incisions, and the finger or forceps : But if a ball well charged, and fired from a moderate distance, hit upon a bone, it will go directly through, shiver the bone and break

it across ; then the ball and splinters are to be diligently taken away, and it is to be treated as a fractured limb of the most dangerous kind ; but if a ball in the same circumstance, hit any broad and spongy part, as the head of the tibia or the condyles of the thigh-bone, it enters into the bone, and sticks there. The ball cannot remain there, without causing a caries of the bone ; it cannot be easily extracted, for it is flattened and nitched into the shattered bone ; then there must be a free incision made, and the trepan applied ; or if it be a narrow and firm bone, M. de la Faye orders us to cut the bone both above and below, so as to cut away that piece in which the ball is fixed.

But still let it be remembered, that it is only the openness of the wound, and the nearness of the ball, that tempts us to search for it ; for a ball sometimes works its way outwards through the cellular substance, and comes to the surface with little pain, or often it lies without danger buried in the flesh, for years, or for life. If there were no other occasion for opening the wound, we should never give the patient pain on account of the ball, since it seldom itself gives him pain. It is chiefly, I say, the openness of the wound, the nearness of the ball to the surface, and the anxiety of the patient about it, that tempt us to search for it or to cut it out. It is chiefly on account of broken bones, or a wounded artery, that we are to enlarge or dilate the wound \*.

\* There is this difference betwixt scarifying and dilating the wounds, that scarifying is that superficial incision of the mouth of the wound by which we relieve the tension of the fascia, or the stricture of the skin ; but *dilating* is that deeper incision, which we make by pushing our finger deep, and to the bottom of the wound, following it with the bistoury, to make a free way for getting at the bleeding artery, or extracting the fractured bone. (e. g.) If there be a musket wound across the fleshy part of the thigh, we *scarify* both the openings ; but if there be a shot passing through the thick part of the foot, we *dilate* the wounds largely upon each side, cut away the ragged tendons, and so have free openings, for the suppuration and sloughing, and for the many fragments of the tarsal bones which must come away.—In slighter wounds where the ball does not penetrate a fleshy part, as the thigh, where no bone is broken, nor no artery wounded ; we refrain from all kind of surgery, and merely apply a piece of dry lint to the wound.

If there be a crushing of the bone and many splinters, you will naturally try to get away those which are loose ; be diligent in removing them with your fingers, or in picking with your lever, or even in pulling them out with your ball forceps. But there is a certain point at which your discretion must stop you ; though the splinters are loose and seem to be lost, yet they are still attached by their membranes, and may live and may be taken into the knot of callus which reunites the bone. You never know what pieces are entirely useless, and you should never be violent in tearing up the larger pieces ; and as for the smaller splinters, they never are so loose as to be washed away. The injections which many throw into the wounds, are very foolish in the opinion of the great Hildanus, who illustrates his objection by a very humble simile : “ Let the servant-maid, says he, wash the piece of meat which she has in her hand ever so carefully, yet, after all her care, and after thorough boiling, the splinters of bone will adhere.” Therefore, it is the advice of the oldest and most respectable surgeons, to leave them to be loosened by suppuration, rather than to tear them up with the forceps.

I shall conclude this head, by remarking to you how distressing it is when foreign bodies are neglected, and remain in the wound.

If any foreign body remain in a wound, the consequence is, that the cure which goes on in a promising way for some time, stops all at once ; the wound which looked fresh, and was suppurating well, turns pale and flabby, discharges a thin serum, and begins to disorder the whole system : for presently an evening fever and a weakening diarrhoea succeed ; or perhaps the wound seems actually healed, but it is not sound within ; the action of the muscles forces the surrounding parts to press upon the foreign body, and accordingly the surrounding parts inflame, suppurate, form an abscess ; the abscess bursts, and discharges much ill-smelling matter, but yet the piece of cloth or splinter of bone is not discharged ; and thus the wound suppurates and bursts from month to month, keeping the patient in some danger and much distress.



A cannoneer, on one of the redoubts of La Hogue, was firing upon some English frigates ; the gun burst and he was wounded in the thigh, by one small splinter only. La Motte, who was surgeon to that line of batteries, and entrenchments, was ordered by the commander to dress the gunner ; but the young man having a surgeon who was his brother-in-law, could not but think himself safer in his hands ; for three weeks, his wound was getting worse daily, and he was weakened by frequent hæmorrhages, which his brother-in-law, and those who assisted him, could neither account for, nor manage. The commander once more, ordered La Motte to attend to the gunner, who was a very fine fellow : La Motte searched the wound in two or three places with his finger : at last, he found one opening particularly deep, which they had never probed, and pushing his finger to the bottom of it, he felt a small splinter of the gun, no bigger than an almond,\* lying betwixt the thigh bone, and the great artery, which he felt beating ; this was the cause of all the distress, and after it was extracted, the patient never had a bad symptom, but was cured of this very deep wound in three weeks.†

In the same way, Ravaton had tried to cure a young man, a Captain of foot, but in vain, while the foreign bodies remained. When this officer came first under Ravaton's care, he had a large wound in the top of the thigh, from which Ravaton had, at the time of the wound, extracted a musket ball ; he continued under Mr. Ravaton, growing worse and worse daily, for three months, during all which time he had continual pain, and frequent diarrhœas, by which he was extremely wasted : His pain was dreadful, and he had such inflammation, and abscesses in the thigh, as occasioned Mr. Ravaton to make five openings with his lancet, on account of collections of matter : At last, after a night of very great pain, there burst out a flood of confined matter, from

\* Observe, that an angular splinter of an iron or brass gun, is very different from a leaden ball, which might have lain quite easy, the wound healing over it.

† La Motte.—Vol. IV. p. 184.

the wound in the thigh. Mr. Ravaton introducing his probe into this cavity, felt a foreign body at the bottom of it, and enlarging it a little, he put in his hand (for the fore was now large enough to admit his hand,) into the thigh, and thence he drew out a small copper key, the key of his escrutoire, three small pieces of a silver seal, and no less than thirteen very small fragments of the cornelian stone belonging to the seal.

#### 4 . OF THE BLEEDING FROM GUN-SHOT WOUNDS.

THE bleeding from Gun-shot wounds remains to be explained ; and I need not tell you, that wherever there is bleeding from a gun-shot wound, it must be a desperate bleeding, from which your patient can be saved only by the greatest boldness and judgment on your part. It must be a dreadful bleeding ; because it is against the nature of gun-shot wounds to bleed ; their bleeding is a sign of some great artery being cut ; and judgment is as much needed as boldness ; because in this case, even the patient's lying easy for ten days is no security against bleeding ; and your anatomical skill is shown by your knowing when the ball has brushed close by a great artery, and by that, and other marks, whether a profuse bleeding is really dangerous.

Since there is naturally no bleeding from gun-shot wounds, to find much blood spouting from a wound, is extremely alarming ; nothing is more likely than that some great vessel is cut ; and whether it be the thigh, or ham, or arm, that is wounded, although we will not allow ourselves to do any thing rash, we must instantly make bold incisions, guided by the finger, until we see the bleeding artery, and tie it up. It has been an axiom of surgery, ever since Paré's invention of the needle, that we may stem a hemorrhage either by styptics, or by compression, or by tying the artery ; but in this case, there is hardly that choice. If we trust to styptics, what will become of our patient, who is hurried from the battle, into a cart, and driven along the roughest roads.

from post to post ; and, until he arrives at the General Hospital, never has a surgeon at hand to stop the blood ? if we intend compression, and so cram the wound with lint, then a firm bandage is required, and either the bandage is slackened during this dangerous journey, or the poor soldier finds it drawn so tight, as to occasion dreadful pain, and arrives at some general Hospital, with his limb swelled to such a degree, that either it is gangrenous already, or is inclined to run into gangrene. For these reasons, arteries, wounded in the field of battle, never can be trusted with a compress ; in such circumstances, nothing is secure, but a free incision, and a fair tying with the needle ; and it is indeed remarkable, that none but the army surgeons understood the value of the needle, when it first came into use. “ I condemn, says Le Dran, that sort of compression which is made by cramming the wound with dry lint :” indeed we may say, with strict propriety, it only conceals the danger ; it suppresses the bleeding for a time, to break out more furiously, when we are least prepared ; it smothers, but does not extinguish the fire.

But the secondary hæmorrhage is still more to be feared, as the hidden danger is always greater than the open danger ; for, as I have said, “ the patient’s lying easy even for ten days, is no security that in the end he shall not bleed to death.” Every circumstance concurs to lull us into a fatal security ; the patient lies easy, and tolerably free from pain ; there is no fever, there has been no bleeding ; even at the first the wound was scarcely stained with blood ; on the eighth day, the eschar of mortified and bruised parts begins to loosen ; on the ninth or tenth day, the sloughs begin to fall ; and if this partial gangrene has touched the coats of a great artery, the sloughing of these coats leaves a breach in its side ; the blood bursts out impetuously, and it is not that the patient may die of a sort of slow bleeding, betwixt night and morning, but he dies in a moment. Ranby tells us that, by such bleedings, he had seen a man die, who had lost no more than twelve ounces of blood ; the loss indeed is small, and such a sudden death may be mentioned as surprising ; but it is not

unnatural, when such a quantity bursts out from a great vessel, and is so suddenly poured out, that the balance of the system, and that resistance which keeps up the excitement of the heart and of all the arteries, should be lost in a moment, and the man die. Surely the knowledge of such things as this, must be a cause of great anxiety, and a motive for continual watchfulness to the surgeon. The watching is a kind of duty which no single man can fulfil; but mates and pupils should be appointed to watch, who can answer for the event; and those patients who have wounds near the greater arteries, should sleep with tourniquets round their limbs, ready to be screwed.

But whether it be an immediate, or a secondary bleeding, the consequences are of the most serious nature: For, first, There is the present danger of immediate death, from the bleeding: Secondly, There is another danger, viz. of aneurisms, formed by the open arteries, that is, of great sacs of blood, formed near the wound, which may require a tedious dissection, for emptying the bag and for tying up the wounded vessel: Thirdly, If the arteries continue open, and bursting out from time to time, then every bursting out of the arteries, will both endanger the patient by the open loss of blood, and will cram the leg with inward bleeding; so that the extravasated blood will fill the interstices of the muscles; produce foul suppurations, and gangrenous sloughs; and will, in the end, cause a corruption of the bones; so that it were better for a man to lose his leg at once, than to be thus long in misery, with so poor a chance of saving it.

Perhaps, the best general rule will result from my explaining to you, once more, in a few words, the intentions and motives for dilating gun-shot wounds; many slighter wounds do not require to be scarified; and where we do scarify or rather dilate a gun-shot wound, it is in proportion to the size of the limb, the deepness of the wound, the smallness of the openings, or their distance from each other; we open or dilate quite to the bottom, every great wound in which any great artery bleeds, or in which there are many great fragments of shattered bones. The ball it-

self is the only foreign body, about which we are less careful, since it is often lodged among the muscles, makes a sac for itself, excites no pain, and lies there harmless, exciting no inflammation nor pain, for years, or perhaps for life. And when the time arrives, in which the wound should heal, but does not heal, we pass, through every such callous sore, a skin of seton, especially if we suspect that any piece of the cloths carried in by the ball has been left behind.

Thus you see that this dilating or scarifying is the chief point in the treatment of a gun-shot wound ; and you will also observe that the wounded artery absolutely requires this dilatation ; the fractured bone also requires it ; the flesh wound needs it less. The wound across the cavities, as across the breast, hardly needs, or indeed allows of this dilating ; for there is no part which is tense, or which needs to slough, except the skin, and outward wound ; and all the rest is, as Mr. Pouteau says of the wounded bladder, " like a stroke in the water : " Thus there is no tension, no swelling, no continued sloughing ; in this, the deepest wound, there is no depth of wound : the outward wounds indeed must throw off a superficial eschar, but all the inward wounds of the pleura and lungs seem to adhere ; and we are often surprised with a very sudden, and very happy cure.

By all this it will appear to you, that the motives for scarifying gun-shot wounds, are just such as you will acknowledge, in the treatment of common wounds ; that the principles being once taught to the young surgeon, all the rest must be left to his discretion and good sense : That these motives are sometimes urgent, sometimes trifling ; and that this scarification or dilatation must be boldly done, or partially done, or quite neglected, according to the exigencies of the case.



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## DISCOURSE VII.

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### OF WOUNDS WITH THE SWORD OR BAYONET, OR ANY CLEAN CUTTING WEAPON.

I AM now to keep my promise, of collecting the minutiae and details of practice, into a few general rules ; which will give a more regular conclusion to a distracting and intricate subject. The speculations on gun-shot wounds are of very little importance in the eyes of the modern surgeon ; that gun-shot wounds are poisoned, is not, at the present day, a matter of debate ; but it is known that they are just as difficult to heal, as if burnt or poisoned, and of this difficulty, even the outward appearance of the wound gives the strongest indications.

1<sup>st</sup>, In wounds of the viscera, you are not to introduce your probe with that unfeeling boldness, which makes every repetition of the practice, a fresh stab ; use your finger only ; use that, too, sparingly ; trust rather to the eye ; look to the general condition of the patient, and the course of the ball ; wait quietly for the symptoms, and be guided by them.

2<sup>dly</sup>, Probe with greater freedom and boldness in wounds of the limbs, and search carefully for the ball, or cloth, or splinters, of bone ; for your future operations are successful, only in proportion as the condition of the wound is well understood.—But if the patient have lain long upon the field, or have been carried in a waggon ; if from any cause his wound be already inflamed, you must refrain from searching ; for it is too late to extract the ball, and you must wait (laying the limb easy) till the suppuration be formed.

*3dly*, The common term, “scarifying of gun-shot wounds,” is an unlucky one ; for we use a word which implies but a superficial cutting, to explain what it never can explain, a deep and bold incision, for extracting broken bones, or for tying wounded arteries ; which must be made large, in proportion to the size of the limb, not superficial in the skin only, but also into the fascia which binds the muscles ; sometimes it must go down also among the muscular flesh. This unlucky word, scarifying the wound, and the sense in which young surgeons have understood it, and the making of superficial incisions, which can never be useful, and of scarifying indifferently all kinds of wounds, has been the occasion of so much doubt concerning the propriety of dilating wounds. There may be required three incisions in a long wound ; there must be two in every wound which passes through a member ; there must be a wider incision where the ball is lost in the limb ; and this single incision should be so freely made, as to change the wound from one penetrating and wide at the bottom, to a wound quite open and much larger at its mouth ; or, in plain terms, it is in proportion to its deepness, that we open the mouth of a wound.

*4thly*, If there be bleeding from a gun-shot wound, you are sure that it is no common bleeding, that it comes, not from the smaller arteries, which are too much bruised to bleed, but from some great vessel, which you dare not for a moment neglect : You must apply your tourniquet, make bold incisions, and look fairly down into the bottom of the wound, that you may apply your ligature surely ; and, since a gun-shot wound is in general bloodless, the want of bleeding is no security that no great artery is hurt ; for if the ball has brushed by the side of the Femoral or Tibial arteries, an eschar will fall off from the artery, as from the other bruised parts, and there will be a breach in its side : Therefore, whenever a great artery is hurt, you must take measures not to be surprised ; if, in putting in your finger, you have felt the beating of such an artery from the wound, you must watch with care from the fifth, to the fifteenth day ; watch al-

ways, while the sloughs are falling off ; and a beating or throbbing in the wounded limb will often forewarn you of the danger.

*5thly*, Instead of using setons or tents to keep the wound open, you should seek relief from free incisions ; and, instead of hot and spirituous applications, (which used to be put to those wounds, when they were thought to be poisoned, the lips looking gangrenous or livid), lay the wounded limb in large poultices, easy and soft, which will at once encourage a kindly suppuration, and assuage the pain ; but as soon as the pain is abated, and the suppuration established, and the sloughs beginning to be discharged, the poultice must be removed, for the continued use of it will but increase the relaxation, the fetor, and the profuse discharge.

*6thly*, You will see that there is no dressing peculiar to gun-shot wounds ; that they are peculiar, rather, in admitting of none. The French surgeons used to employ themselves and their attendants in rolling long bandages with curious neatness, and intricate reverses and turnings, which, though they might keep up the parade of surgery, occasioned so much pain to the patients, that they were ridiculed even in the French Academy, and by their own great surgeon, Le Dran. There are now none of these bandages used, which you see so finically drawn in books ; no setons are drawn through the wounds loaded with medicines, always of doubtful, sometimes of a very mischievous and irritating nature ; no spirituous applications, which might be considered as the real poisons, nor any burning with caustics or oils, which indeed they used hot enough to melt the very ball with which the wound was supposed to be burnt ; we do nothing now but wrap the limb in a large, soft, warm, and comfortable, oily poultice ; in short, we in Scotland call a poultice a bath ; and if you will make every poultice, literally, a bath for the limb, you will do your patient great justice ; poultices, in the first inflammatory stage, are the properest applications ; setons at such a time are irritating and dangerous ; the old apology for using them, *viz.* the bringing out the sloughs, is a very absurd one : Seton, injections, and bandages are never to be used till the wound have degenerated into a fistulous sore.

These rules represent to you now, at once, both the peculiar nature of gun-shot wounds, and the intention and manner of treating them ; of searching wounds, of enlarging them ; of securing arteries, and of extracting balls ; and I am very sure, that I have been so orderly, that I can neither have omitted, nor slighted any rule of real importance. But, besides this, an army surgeon must understand the nature of other wounds ; and indeed, upon comparing gun-shot wounds with cuts of a sabre, stabs of the bayonet, or thrusts of the small sword, we find them differing in all the essential points ; they are not bruised nor gangrenous ; not dangerous from after bleeding, nor tedious from casting off sloughs ; there are no motives for scarifying ; nor are there any painful extractions of foreign bodies ; no slow exfoliations, nor irregular suppurations, nor new abscesses appearing just when the wound should heal. But, on the contrary, sabre wounds are easily reunited, like the flaps made by the surgeon's knife ; and even bayonet wounds among the viscera are so very different from gun-shot wounds, that when the first dangers are over, we pronounce the patient safe ; nay, I shall have occasion to explain to you, upon rational principles, some recoveries from bayonet wounds, which look more as if they had been owing to the art of magic, than regular surgery ; recoveries of men whose breasts had been fairly transfix'd with the weapon, and the wound managed in so peculiar a manner, that they have been walking in the streets, sound and well, in a few days.

Here then you enter upon a new line of practice ; forsake entirely the probings and incisions of gun-shot wounds, expecting to perform the cure upon easier terms. For when there is a fair cut, put it together, and it will heal ; when there is a large flap made by a sabre, put it down as confidently as if you had made it in some regular operation, and it will adhere : even when there is a penetrating wound, far from opening it with incisions, close it with a compress, and put its sides together by a rolled bandage ; and if there be no open artery to fill it with blood, even this penetrating wound will close, and be obliterated in a few days.

These are simple facts, proved by every day's experience ; upon the rules therefore resulting from them we can rely ; but they are so unlike all the principles and practices which I have recommended hitherto in penetrating wounds, that I find the simple enunciation of them will not be sufficient : It is necessary, then, that each of these three rules should be expanded by representing the accidents of real practice.

1. THE first rule is, That where there is a fair cut, or even a flap of the largest size, put the wound together, or lay down the flap, and it will adhere.

When a sabre cut upon the head flaps down the scalp, and lays bare the scull, too often such a flap is cut away, and the bone spoils ; and not seldom, after such imprudence on the part of the surgeon, the brain is affected with the inflammation, and the patient dies. But if the weapon have touched the scull itself, and if but a small piece of the outer table only be razed, then, without any motive, and against all rules of good surgery, the surgeon very often applies the trepan. Here there is no motive for applying the trepan, for there is merely a clean cut passing sidelong through the scull, so that there is no heavy blow such as might hurt the brain ; there will most likely be no extravasated blood ; very often the patient rides into the camp, and comes himself to be dressed to his surgeon's tent. I do not say that in such case there can be no danger, the brain may certainly inflame ; but at the time of such a wound there is neither inflammation of the brain, nor any actual wound of it ; and the most effectual way of preventing every danger, is, to put down the flap immediately, and cover up the wound. If there be any real danger, suppuration will come on, and the flap will never adhere ; but if there be no danger, the flap, even though laid upon the naked brain, will adhere as in a common wound ; therefore, either after cutting away the piece of bone, the flap may be laid down, or the piece of bone still sticking soundly to the flap, may also be preserved, and laid down along with the flap ; and being a living part, and having its circulating vessels, will adhere.



This is a fact of some importance ; it has been but little observed till of late years : It was thought to be a new discovery, when Mr. Meinors, a surgeon, published, in a periodical paper, that he had laid down the scalp, and made it adhere, after a great operation of trepan. But Mr. Meinors, like many young surgeons, has been too little employed in studying the older ones, and has, like too many inventors of old discoveries, spoken vainly of a practice which is two hundred years old ; for Berengarius Carpenfis, an old Italian surgeon, not only knew how to save the scalp, but he knew also that we might very safely lay down a piece of the skull itself, provided only the cut was clean. He tells us of a soldier, who was so wounded, I believe with a halbert, that the greater part of the frontal bone was cut quite down to the orbit ; the frontal bone was still connected with its skin, and the skin and the bone together hung down flapping over the eyes. My father, says Berengarius, being called, cut the bone away from the scalp, laid the skin up again upon the forehead, sewed it in its place, covered the stitches and the wound with whites of eggs, it adhered, and, after ten days dressing, the cure was perfect, and the pulsations of the brain were felt where the bone was lost. He confirms this practice by other cases, in which he had ventured also to put down the bone. Le Dran gives the same directions for sabre wounds ; and Parée tells us, that a captain was so cut with a sabre in the parietal bone, that the dura mater was exposed, beating, and the bone was cut so cleanly, that it was turned back over the face, remaining attached only to the flap of the skin. Three fingers' breadth of the bone was thus cut up, and Parée was about to cut it away, when, recollecting Hippocrates's rule, of never exposing the dura mater, he put it back into its place, sewed it there with three points of the needle, and made a perfect cure.

The difference between gun-shot wounds and the clean cut of the sabre is so great, that while a touch upon the head, by the grazing of an oblique ball, is very commonly fatal, it often happens that a soldier escapes, whose head has been so cut with the

fabre as to lose the bone and scalp, and even a part of the dura mater, with a wound, even of the brain itself, which requires many months to cure. In these curious facts I should like to instruct you more fully, by comparing such interesting cases with each other ; but I must rather pass on to observe one thing more concerning flesh-wounds, which is not less interesting, viz. That a man may be stabbed with a hundred flesh-wounds, without being in danger.

Habicot, in his dissertation upon the operation of bronchotomy, tells us, that he once had a young man brought to him, who had been stabbed by robbers with no less than twenty wounds in the breast, throat, limbs, and private parts, so that his first surgeons had left him for dead. Habicot carried him into his surgical school, where he continued with his pupils, from seven at night till one in the morning, dressing all his wounds. One in the throat was so desperate, that he was obliged to perform bronchotomy ; and yet the young man was safe, and in three months was quite restored.

II. THE second general rule is, That, as far as it can be accomplished, it is your duty, in a penetrating wound with the sword or bayonet, to bring it into a condition in which its sides may adhere ; that is, to cleanse it of its blood, to close the wound, (but not till it have ceased bleeding), to lay its sides together with a tight bandage, and to close its mouth with a slight compress.

The difference, betwixt a gun-shot wound and that made by a bayonet or sword, will be best understood by attending to an individual case ; a wound, for example, of the fore arm. If a ball pass along the fore arm, entering at the wrist and going out at the elbow, taking along the bones ; in a bruised wound of such a length, it is the rule, you know, to make no less than three incisions, one at the entrance of the ball, one at the place where the ball goes out, and one somewhere in the course of the wound ; these are necessary to prevent collections of matter ; the wounds need to be kept thoroughly open, and still the whole canal of the wound heals with difficulty, and we are never out of fear of arte-

ries busting out along with the eschars, nor of new collections of matter ; and very often the bones are so spoiled by collections of matter that the fore arm is lost : this is the nature of a gun-shot wound. But suppose a young man, in fighting a duel with the sword, to be wounded in the sword-arm : His antagonist's weapon goes in at the wrist and out at the elbow : if in such case any great artery be wounded, then indeed it injects the arm with its blood, forming a proper aneurism, so that we are forced to cut up the fore arm, and tie the wounded artery : but if it be merely a flesh wound, it is no doubt somewhat dangerous from being deep and penetrating ; but still it is so little different from a common and open wound that, could we bring the sides of this tube-like wound fairly into contact with each other, it would close in a day, just as the lips of a common wound adhere in a day ; and the reason that it does not happen so is plainly this, that the blood which exudes from the very smallest arteries is sufficient to fill the tube of the wound : it not only fills it, but the bleeding going on within side, while it is prevented with a compress and close bandage from getting out, the tube of the wound is not only filled, but dilated with blood : and, therefore, you are sensible, cannot adhere. It does not adhere, just for the same reason (as I have observed) the healing of an ill-amputated stump, is delayed where the arteries not being fairly tied, have bled after the dressing so as to fill the basin of the stump, and separate the flaps from each other, and not only prevent adhesion and bring on suppuration, but produce (from the grumous blood) a gangrenous stump filled with foul and stinking matter, partly purulent, partly consisting of blood.

Perhaps you will say, why should we not, in a deep wound, suck out this blood, and then tie up the wound close ? Now this is the very point ; and what we should suppose beforehand would be useful, has really been done with great success. You need not be told, that there are many romantic stories of friends having sucked the wounded among the ancient warriors, and having restored them to health. Perhaps you may not know, that this op-

eration of sucking wounds is so much used in eastern countries as to have become a regular profession. Nay, in a country not so far off, in France, it was the custom to cure wounds, by suction, inasmuch that there also it became a trade. Certain people in a regiment, for example, or in a village, were famous for their skill in sucking wounds, performing wonders, and confounding the regular surgeons, and obliging them at the same time to confess the efficacy of this treatment ; so that when two soldiers went out to decide a quarrel with the sword, they carried a sucker with them, who in cases of flesh-wounds, and frequently also in severer wounds, performed his function with such wonderful effect, that very commonly the soldier was able to walk home and do his duty, and the affair was entirely concealed.

Were this thing merely curious I should drop it here : but it is a fact both so little known, and so useful and well authenticated, that I must explain it to you : for, although it may not be a rule nor practice for your imitation, yet at least it explains and establishes a principle, the knowledge of which may be of real use, viz. That blood extravasated within the cavity of a wound prevents adhesion, while the sucking out of the blood rendered the cure quick and easy.

This kind of cure was called the *secret dressing*, either because the young men who were wounded in duels were by it enabled to conceal their wounds, or rather, perhaps, because being performed with some ceremonies which were disagreeable to the priests, they refused absolution or extreme unction to those who had submitted themselves to the secret dressing ; and for that cause also it was concealed.

The suckers, to keep their profession to themselves, pretended to make it a magical ceremony ; they muttered words through their teeth, made some strange motions, and then drew the sign of the cross. It was from this profanation that there arose a horrid war betwixt them and the priests : the priests refused extreme unction or any sacrament, to those who had undergone these magical or diabolical ceremonies ; while the suckers, on the other



hand, refused to suck those who should have any commerce with the priests, pretending that the Christian rites of the sacrament or extreme unction interfered with their incantations : though, after all, this sucking business was very simple, very useful, and so entirely natural in its effects, that they can be very easily explained.

The sucker was present at every duel ; the rencounter ended the instant that one of the combatants received a wound ; the sucker immediately applied himself to suck the wound, and continued sucking and discharging the blood till the wound ceased to bleed, and then the wound being clean, he applied a piece of chewed paper upon the mouth of the wound, tied up the limb with a tight bandage, and the patient walked home.

They sucked till the blood ceased to flow ; none was left in the wound to prevent the sides of it adhering : Their function thus emptied the vessels, cleansed the wound, brought the blood towards the wounded part, produced, like the application of a cupping glass, a gentle and easy swelling, which brought the sides of this tube-like wound so fairly together as to make them adhere ; they healed as if by a charm, while in truth their healing so, was a most natural consequence of this pleasant treatment. But however promising this may appear in theory, it is still necessary that it should be proved by experience to have been really successful ; and no authority can speak more convincingly to this point than the cases which La Motte has recorded, who was himself an eye-witness of many wonderful cures, “ such as are incredible,” says La Motte, “ to those to whom I relate them ; and yet I need not be surprised at this incredulity, since they are cures which I could not have believed myself, unless I had actually seen the thing done.” In short, La Motte had seen the wounds of swords passing quite across the breast or belly, had seen the scars of these wounds, and had the faithful testimony of these secret combatants ; but he would believe nothing, unless he were allowed to put his finger into the wound.

I never doubted, says La Motte, that this secret dressing might cure a flesh-wound of the arm, for example ; but that the suckers



should cure in this way a thrust through the breast or belly, seemed very strange ; till one day I was called to attend a young fellow, a common foldier, who had been run through the breast with a fair lounge, in at the pap and out at the shoulder. After having examined the wound, and noticed the length of his antagonist's sword, being well satisfied that the weapon had pierced the lungs, and gone quite across the breast ; I saw the drummer of the regiment, (who was the sucker on this occasion), do his business ; he first sucked one wound, then, turning his patient over, he sucked next the opposite wound ; he then applied a piece of chewed paper upon each, and next day the foldier was seen walking in the streets.

After this La Motte saw a man of better condition sucked with the same success. He was the Brigadier of a horse-regiment, who had been wounded quite across the lungs, but without any material harm to the lungs, or great vessels. Thus, says La Motte, is this way of sucking wonderfully successful ; and would always, I am persuaded, be so, did the suckers but limit themselves to the right cases of simple wounds of the limbs, or even of the breast ; but they suck indiscriminately every wound, and wherever there is extravasated blood, as in the thorax, oppressing the lungs, they must be unsuccessful.

Wounds therefore of the sword or bayonet, in the arm or thigh, may be cured by suction, and by putting their sides in close contact ; and whether this be an old practice, or an odd one, unlike the business of a regular surgeon, is not the question ; but if it be useful, that is the main point ; and it is here proved that it is useful, not only in flesh wounds of the limbs, but in wounds across the cavities, where there is no great vessel, nor any of the viscera wounded, and where there is no extravasation of blood.

However proper setons and tents may be in gun-shot wounds, where there is a loss of substance, a sloughing wound, and of necessity a tedious cure, they must not be used in a clean wound, made simply by the thrust of a sword, or by the stab of a bayonet or knife ; but on the contrary, if the surgeon be called early, he

may apply his long compreffes, with a tight bandage, instantly ; for that will both prevent bleeding, and ensure a speedy adhesion ; but, if he be not present, he must try to get out the blood by washing and softening the wound, and then put it so together with his comprefs and bandage, as to give it a chance of adhering. Our old surgeon, Wiseman, was much offended with the practice of a Spanish surgeon, who, when one of the English sailors was wounded with a rapier in the arm, stitched up the mouth of the wound closely. “ This case, says he, I insert, to show you, that such wounds ought not to be stitched, but dressed up with ASTRINGENTS, COMPRESS, and BANDAGE ; for so those wounds, in a good habit of body, with comprefs and bandage, do frequently agglutinate in a few days \*.”

Nor is even a clean wound of the abdomen, made by a sabre, difficult to heal. It is a doctrine, to be sure, that wherever the bowels are exposed to the air, the air will excite inflammation, and the patient must die. This is the doctrine indeed ; but doctrine, when opposed to practice, is of very little value. Indeed, the absurdity of this doctrine is manifest ; for daily, in strangulated hernia, we open the bag of the hernia, inspect the condition of the bowels, handle them, and turn them round, (exposed thus to worse injuries than the air), and then we thrust them back into the belly, with no little force, and yet all is well. What then would become of this so common operation for hernia, if the bowels were always to inflame, or even if commonly they were to inflame upon being exposed to the air ?

Thus in sabre wounds, if but the bowels are safe, if no turn of intestine be wounded, though the bowels descend through the wound in the most shocking manner, so as to be supported by the hands, still if they be put back, as in the operation of hernia, the patient may be safe ; he will not indeed always escape, but he will sometimes : and one case of this kind will do much in establishing our confidence in the powers of nature.

La Motte once, when a person was wounded in the side, cut

\* Wiseman, Vol. II. p. 82.

off a large piece of omentum, put back the protruded intestine, and the patient did well.

Mr. Rofiere, a French surgeon in Lower Normandy, put back the intestines into the belly of a peasant's boy who had been gored by a bull. The boy came the next day on foot three miles from his village, carrying in the skirts of his shirt, and in his hands, a great bundle of the intestines which had protruded again ; they were put again back, the wound was neatly sewed and the boy being kept quiet for some time, made a very perfect recovery.

But there is recorded a third instance of this, still more surprising, of a foldier who was wounded in the side with a halbert. He walked a full mile with his intestines protruding from the belly. He also had wrapt them in the skirts of his shirt, and carried them (not in his hands, but) in his hat. The weather, it being mid-summer, was intensely hot, and the roads dusty ; and it was reported to the author, who relates the story, that the intestines were as dry as parchment, and blackened with dust. He was brought to a charitable old lady, who having bathed the intestines in warm milk, replaced them, and stitched the wound with the needle ; and this foldier also was perfectly cured.

But there is another case, still more wonderful, related by Dr. Cochrane, of a negro, who, resolving to take away his own life, stabbed himself in the belly in a shocking manner, so that his bowels hung down from the wound. He refused all assistance, always tore open the wounds ; and the negro-driver, with a brutality exceeding all that we have ever been told of the shocking punishments and very miserable condition of that unhappy people, swore that he was a worthless fellow, and then turned the key upon him, leaving the poor wretch weltering in his blood, and lying naked on the floor of his very miserable hovel. Next day the surgeon found him alive ; but it is no wonder that a fellow creature, feeling himself a man, and seeing himself thus neglected and abused, resolved to rid himself of existence. He still refused all help. He lived in this condition, still neglected, till at last he was able to crawl out of his hovel. He was seen going to town carrying the protruded bowels in the coarse blanket which was

wrapped about him. He was seen by Dr. Cochrane with the protruded bowels all inflamed and granulating, shooting out new flesh, and covering themselves with a kind of skin. He sauntered about the plantation, swam often in the sea, lived this idle and irregular life, but nothing interrupted his cure, which was soon perfect. The tumor of the intestines was like a woman's breast, and he became strong in the end, and fit for labour.\*

After recoveries from such protrusion of the bowels, and such desperate wounds, nothing can seem wonderful: indeed it is not with the desire of raising your wonder, but with the design of establishing your confidence in the powers of nature, that I close my account of sabre wounds with the notes of these very singular cases.

I shall proceed to sum up the conclusions arising from the facts and reasonings which I have put before you. You will foresee a set of rules very different from those belonging to gun-shot wounds; for you perceive that flesh wounds with the bayonet, or sword, or sabre, are less dangerous than gun-shot wounds. These require no scarifications, no openings, no setons passed through them; there is no painful searching for foreign bodies, nor any slow exfoliation of bones; there is neither any danger from too high an inflammation, nor any great risk of gangrene. If they could be but freed of blood, and their sides closely applied, there might be an almost immediate cure. The practice then is extremely simple, and may be tolerably represented by these rules:

1<sup>st</sup>, If there be a simple wound raising a flap of skin, perhaps touching the skull, or even reaching the brain, it may be put down to adhere; and if there be no danger below, if there be no extravasation of blood by which the brain might be oppressed, or the adhesion of the flap prevented, it will adhere; and of course,

\* The author adds an analogy well suiting the climate in which all this happened: "Often the mules being gored by the cattle, the owners, having secured them, reduce the intestines, and stitch them up, without any bad consequences."



we have this comfortable assurance, that, if all be found and safe, the flap will adhere ; but if there be extravasated blood, splinters of bone, or any cause of danger, it will not adhere ; and this laying down of the flap is an easy attempt, and never can be productive of any harm.

2d, Where there is a clean sabre cut in any of the limbs, if there be no great artery wounded, even though the weapon should have penetrated or cut across a bone, it will heal ; it is only intervening blood that can prevent its adhesion, or some fault of the constitution, some infection of the hospital, or some camp disease. Wherever we expect to heal such a wound, we are careful to wash away all clots of blood, to allow the bleeding vessels time to exhaust themselves and to stop ; and then, instead of wrapping such a limb in relaxing poultices, we clean the wound, put the edges neatly together, stitch it perhaps, cover it with an adhesive plaster, dress it dry with lint, and never apply any poultice, unless it should be required on account of pain and swelling, and that will only be on the third or fourth day.

3d, If there be a deep and penetrating wound, we try to bring it to the same condition with a clean open wound, to purge it of its blood, and so cause its sides to adhere ; and the successes of the secret dressing, so much practised in France, should not at least be despised as a hint, if it be not indeed a direct lesson for the imitation of the surgeon. And however we do in this respect, yet there is this established difference betwixt a gun-shot wound, and the stab of a bayonet, that we make no incision, unless there be some bleeding artery which it is necessary to command ; we make no openings in the middle, of even the longest sword wounds ; and as for setons, their use is doubtful, even in the case of gun-shot wounds, where there is a sort of tube lined with callous parts, which are to fall into gangrene, and to come out in the form of sloughs ; but in a clean wound they would excite inflammation in a most dangerous degree. Setons, then, are never to be used in wounds with the sword, unless they have become absolutely callous, and continue for months in the condition of fistulas without any ten-



dency to heal, but the use of setons in fistulous fores, or of occasional incisions, when abscesses form, must, with many lesser distinctions and rules of practice, be left to the discretion of the surgeon.

*4th*, If I have related some cases of recovery from wounds passing quite across the breast, and of others where the bowels had been exposed, it was surely not to represent what will commonly happen, nor merely as things to be gazed upon as curious, but not instructive ; you may draw this useful lesson from them, that even in the most hopeless case we must not despair, and that our cares for our patient's safety should cease only with his life. And having spoken so much of wonders which nature will perform, it is the more incumbent on me to show you how dangerous wounds of the great cavities are, even when the danger appears trifling ; for if but the point of the bayonet or sword enter into the abdomen, full hardly can that patient escape : His condition is much like that of a man struck with the filetto, (in the countries where that barbarous kind of murder is so often committed,) where the weapon is long and slender, and the assassin, striking from his dark corner, draws back the filetto by its thong, and the wounded man neither sees the hand that struck him, nor, though wounded, can he see the wound ; he is carried into the hospital ; the wound is so small, that it is hardly distinguished even by the surgeon ; and there the patient lies to take his fate, not sensible of half his danger, till on the second or third day that pain begins of which he is soon to die in inexpressible torments, without a possibility of relief.

The last observation, therefore, is, that though sometimes the most dreadful open wounds of the great cavities have been cured yet the smallest penetrating wound, touching the bowels, is commonly fatal ; that the wound of the bayonet is of this kind ; that inflammation of all the bowels is the cause of the dreadful torments in which they die, often delirious with pain ; that bleeding, profuse bleeding, frequently repeated, is the only chance you can give your patient of escaping this terrible death.

I have said, that the practice in *fabre-wounds* may be tolerably represented in these rules ; intending, by this limited expression, to put you in mind, that this cannot be considered as a perfect system of rules, and that much is still left to the direction and conduct of the surgeon ; for if much were not still left to the discretion and good conduct of the surgeon, where would be that superiority of knowledge and judgment which we are all striving to attain ?

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## DISCOURSE VIII.

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### ON THE MEDICAL TREATMENT OF DANGEROUS WOUNDS.

**H**OWEVER worthy of your attention those rules of practice may be, which I have been hitherto employed in teaching you, yet there are many things which it is more important for you to be acquainted with than the mere surgery of dilating wounds, or extracting balls. Thousands perish by diseases, while a very few die by the sword ; and the fate of the wounded depends much upon their being kept free from those diseases which follow an army, like the vultures that hover over its course. The medical treatment then must be more important than the mere surgery of gunshot wounds ; and I shall endeavour to explain to you how to conduct your patient through these dangers ; by bleeding, while in danger of inflammation ; by rich diet and wine, while undergoing a long and weakening suppuration ; and by bark, when gangrene is likely to come on : And I shall explain to you, as well as I am able, all that hurts or heals his wound, and all that endangers his general constitution, or keeps it safe ; for indeed upon these matters, more than upon the immediate wound itself, depends the patient's safety.

In a subject like this, there must, no doubt, be some great and leading idea, which, being seized and unfolded, would make every subordinate idea easy and intelligible, and render the whole line of conduct very direct and plain ; but I am sure that this general idea cannot be made good to you without a knowledge of the whole subject, of which I must not suppose you are possessed. I am sure it will be right to depart from my usual plan, and, instead of a general and diffuse explanation, followed by closer rules,

lay down the general rules first, and then proceed to reduce from the practice itself those principles, without which the subject cannot be fully understood.

I. When your wounded patient is first brought to you, he is in great confusion ; there is a tremor, a tonic stiffness, or almost a convulsion of the whole frame ; there is a coldness, fainting, and nervous affection ; but it is merely a nervous affection, and you should treat it as such. You may expect it to subside in time, and therefore should give some warm cordial and large opiates to quiet the commotion ; this is no time for bleeding, whatever the nature of the wound may be. If the stupor continue, you should give cordial draughts, and wine.

II. If this nervous commotion being quieted, a sharp fever should come on, still do not bleed, but rather be upon the reserve ; for perhaps this, which at first seems to be a pure inflammatory fever, may turn out to be a fit of an ague, to which the patient is subject ; it may be a low malignant fever ; it may be an attack of some camp disease ; and if a diarrhœa, great weakness, and low muttering delirium, should come on immediately after you had bled your patient freely, you would be distressed at the thoughts of what you had done, and you would, indeed, have much to answer for.

III. Reserve your bleedings for those more dangerous cases, where high inflammation is so often fatal, and do not bleed in wounds of the hips, shoulders, or limbs ; reserve bleeding for wounds of the breast, or belly, or great joints ; for, in all wounds of cavities, inflammation, which can hardly be escaped, is the great danger.

IV. If a man be wounded after a full meal, there can be no doubt that a gentle vomiting must be useful, where it is allowed by the circumstances of the wound. The old physicians found their advantage in it, and ascribe the good effects of vomiting to the preventing of crude and ill concocted chyle from entering into the system, so as to kindle up a fever. There is no doubt, that a meal, which was no load during health, will be a great oppression upon a disordered system, and the carrying it off must be a

great relief ; although the old physicians, by talking this useless jargon about ill concocted chyle, might almost provoke us to reject both the doctrine and the practice. The system cannot be weakened by a gentle emetic ; and if the system should fall low after vomiting, it were easy to substitute a fitter support and better excitement than that of an oppressed stomach and loaded intestines, by first discharging these crude meals, and giving, when the stomach were emptied, food of easy digestion, and cordials suited to the condition of the system.

V. But in every wound there comes a period of weakness, in which we repent of every bleeding that we may have made, even when it was really needed ; a period in which, by confinement and pain, occasional fever, diarrhoea, profuse suppuration, or colliquative sweats, the patient falls so low, that it is not easy to support him through the cure ; and thus there are two great principles in the treatment of gun-shot wounds ! That even at first we should be sparing of blood ; and, that the period of weakness which is to succeed, is the greater danger ; on this single point hangs all the practice.

We are not entitled to bleed in a mere flesh wound, because every gun-shot wound is first to fall into a partial gangrene, then to give out a profuse suppuration ; and if there be no wound of a joint, nor fractured bone, the first inflammation never runs too high.

Since then there is no danger from the present inflammation of a flesh wound, why should we waste that strength with bleedings, which is soon to be so severely tried by weary confinement, great gleetings, profuse suppurations, and pain, and want of rest ? Here we are to expect from time to time new collections of matter, new paroxysms of pain, new discharges of balls or pieces of cloth, and still returning accessions of fever, which quite exhaust the patient, till in the end perhaps he dies.

Bleeding is to be used only in the spring, when new recruits have come into the fields, full of young blood, and inclined to every inflammatory disease ; in spring also, even the veteran soldiers



have lain in cities during winter, and are recruited from the fatigues of their last campaign, so that they even will bear bleeding ; in spring also the peripneumony, rheumatisms, and inflammatory diseases of all kinds, prevail. With officers also, it is plain, that bleeding may be more freely used than with common soldiers, for the officers feel less of the hardships of a soldier's life ; the officer is fed, and clothed, and lodged well, and too often indulges in wine, and lives luxuriously, while his fellow-soldiers are suffering the severity of the weather, and the want of clothing, with poor diet, unwholesome drink, and all the other hardships of war. It is perhaps a proof of this that Mr. Ranby, in his book, gives no examples of success from free bleedings but in young men of high rank, most likely because those young men were better able to bear this practice ; but I fear too there is something here of flattery to the great, a meanness from which the high abilities of Ranby should have exempted him. He must have felt, when he spoke only of the wounds of princes, that a poor fellow in the ranks was as fair a subject for observation, and his wound as good an argument in a point of practice, as that of the *Heir Apparent* : If Ranby would show himself thus fond of curing princes, he should not have been ashamed also to speak of men.

I think it of more importance to repeat the cautions against bleeding, than to direct you when to bleed. I say you must not bleed so freely in common soldiers ; you must not bleed those exhausted with the fatigues of a long campaign ; you must not bleed in autumn, when diseases of weakness are frequent ; you must not bleed in the midst of camp-diseases, when dysenteries or fevers prevail ; and in the foul air of hospitals, bleeding, how much soever it may seem required, should be done with a very sparing hand ; to be bleeding can hardly be necessary in a mere flesh wound.

It remains then for me to mark out for you the precise cases in which bleeding may be freely used.

You must bleed freely in all wounds of cavities, for there inflammation is the most immediate and pressing danger. Your

bleedings should be for preventing the inflammation, for they will not cure it. If inflammation once come on fairly, you can hardly save.

If inflammation come upon the breast, the pulse rises, the patient breathes short, with such pain and oppression, that he is at last suffocated, and dies. If the belly be allowed to inflame, he dies in torments which are called "*miserere mei*," as not to be described. And as for the inflammation of a wounded joint, it is attended with such violent fever and racking pain, that the patient dies ; or, if he passes through those first dangers, it is only to die more slowly of the great discharges, while the eroded cartilages and thoroughly diseased bones extinguish all hopes of a cure.

Now, if a patient will keep such a limb, or if he be wounded in the belly, head, or breast, or perhaps with two such dangerous wounds, you must bleed him profusely, I had almost said, without bounds. But, while I deliver this lesson, I cannot but remember to qualify and limit this rule of bleeding, by showing how much you may go beyond the mark.

The French surgeons are accustomed to bleeding, with a freedom which an English surgeon has no idea of, and can hardly excuse ; for they bleed twice, thrice, or even four times in twenty-four hours, and continue it sometimes to the fifteenth or twentieth day ; and there is no doubt that sometimes, by such profuse bleedings, they have saved those who would have been lost by a more timid practice. It is to this daring practice that I ascribe their success, sometimes wonderful, and especially so in wounds of the cavities or joints ; but there are cases which might be produced from the best French writers, which should serve you rather as warnings than as examples ; and I shall give you such a case, from the practice of Mr. Ravaton, one of their most famous surgeons ; a case which I mention the more willingly, because Mr. Ravaton seems conscious that he had gone too far, confessing freely, that his patient was saved rather by his own natural strength, than by the surgeon's skill.

He was a young man belonging to a militia regiment, and was

desperately wounded in a duel, and the corps wishing to conceal the affair, entreated Mr. Ravaton to receive him privately into his house : The sword had passed across the breast, in above the pap, and out betwixt the fourth and fifth rib behind ; he was brought to the surgeon's house more dead than alive, insensible, without pulse, continually putting up blood ; there being emphysema at each wound, Ravaton dilated both ; the difficulty of breathing was such that he could not speak, but tossed himself in the bed from side to side, six times in the minute, throwing about his legs and arms in great agony.

He was bled copiously five times in the space of three hours : before the evening he was able to speak ; by eleven at night he was much relieved. So far every thing was well.

But here followed something still more daring. Mr. Ravaton ordered an apprentice to sit with lights in his room, and instructed him, that if this distress continued he should open the vein during the night. Mr. Ravaton, from his chamber, heard him crying out during all the night to be bled, and in the morning he found that the young man had drawn blood no less than nine times.

By this bleeding the patient had fallen into a state of insensibility, in which he lay for two days ; and, when he recovered, he awoke as it were from a dream, neither remembering his having been wounded, nor having any consciousness for some time of his dangerous state. He complained no longer of the difficulty of breathing ; and, by giving him nourishing soups and broths, Ravaton recovered him from his dangerous weakness ; the cough, fever, excessive sweatings, gradually subsided, and on the twenty-second day he left Mr. Ravaton's house, though quite pale, and woefully reduced.

Ravaton words this account so cunningly as not to make any clear confession of his own rashness ; but he gives a strong hint, that, on the morning, he really feared that his apprentice had bled this young officer once too often\*.

\* Ravaton, p, 260.

Such imprudences as these I am sure you never will commit ; for I know that it will be difficult for you to keep up your resolution to that assurance and boldness in bleeding which is really needful. You will be too fearful, I am persuaded, rather than too bold ; and therefore I must conclude with observing that even this bleeding was not fatal, and that in wounds of the bowels and joints bleeding can hardly be too profuse ; but still you must be careful, that while you dare to do every thing that is necessary for present safety, you risk nothing which may produce future danger.

Thus you are to use bleeding boldly, but with discretion ; you are to use it in the young and healthy, in wounds of the head, the breast, the belly, or of the great joints.

But this is not in the common course of things. Battles or sieges seldom take place in the spring ; the army is moving easily ; few are sick, and still fewer wounded ; the few that are slightly wounded are sent to lie in the nearest towns, and those who are wounded in the great cavities generally die.

But your practice begins when all manœuvring is over ; and when, towards the end of the campaign, there have been great battles and sieges ; when perhaps the army is retreating, while all around you is nothing but confusion and distress. The wounded increase in number ; they are crowded into hospitals, and hurried from place to place ; they are exhausted with the fatigues of the field, and their sickly constitutions are now entirely worn down, with long suffering and pain. In short, thousands are in danger of low fever, while a very few only can need bleeding, or even be in danger of inflammation, unless indeed it be of that erysipelatous or gangrenous kind which is so frequent in hospitals and camps.

The second great principle, which I proposed to you somewhat in the form of a theory, is therefore more respectable than a mere theory. It is not so much a general theory, it is rather a general fact, and written in characters so plain that he that runs may read ; and it is well that you be instructed in this ; for though the

omission of bleeding when required be a great fault, to bleed a man who is in danger of low fever, or labouring under a camp-disease, were to loosen entirely the little hold he might have of life.

Perhaps it may not yet appear distinctly to you that there is any strict connection betwixt the condition of the system and the easy healing of wounds, because you do not know that the fever which attends gun-shot wounds is generally of the low kind, and that every thing that depresses the system, though but for a moment, changes the face of the wound.

The fever which attends an ill-conditioned gun-shot wound, is attended with great heat, thirst, a foul tongue, a low, quick, unequal pulse, and there is a low muttering delirium, or, as Ranby expresses it, the head not quite clear; and bark, wine, and elixir of vitriol, are to be used.

And as for the wound itself, the worst appearance of a gun-shot wound always proceeds from weakness, arising from some very direct and manifest cause: nor does the wound ever look thoroughly ill, till the patient is weakened by long confinement or imprudent evacuations, or, as often happens, from excess of the natural discharge.

Ranby remarks, that the stump shall promise all imaginable success for eight or ten days, when, suddenly changing its complexion, it shall begin to gleet prodigiously, look pale, and flabby; "and this glecting, or profuse discharge, runs the patient out of the world in a little while." The cause of this change on an amputated stump, or of the ill condition of any gun-shot wound, is plainly weakness; for, if a patient be using the bark, or opium, or wine, if he be deprived of the support of these medicines for a single day, the fores change; if he be seized with the fit of an old ague, or is attacked with dysentery, fever, or any camp-disease, the appearance of the wound instantly changes; and, when at any time diarrhœa comes on, the wound is altered as suddenly as the complexion; and if the looseness continue but a few days, the wounds go all wrong, for the patient, being weakened, be-



comes cold in his extremities, his visage becomes ghastly and yellow, the stump looks flabby and pale, and the flesh separates from the bones, the bone projects, the relaxed vessels ooze out a bloody serum, and the blood lying from dressing to dressing, produces a putrid fore, of which the patient dies.

If you are in a great hospital, you will perceive the stumps, the sores, the gun-shot wounds, and the fractured limbs, all go wrong at once ; any general cause of weakness, or fever, produces this change over the whole hospital, while any particular cause of weakness will produce it in any one individual case. The paroxysm of an intermittent fever, the accident of a foul stomach, two days of diarrhœa, will not only change the complexion of a fore, but will alter its nature in a degree not easily to be counteracted.

And in the largest hospital one foul fore or gangrenous limb, one unlucky fever, or the crowds of wounded which a battle pours in upon them, makes a whole hospital exhibit every where the same dismal scene.

The marks which distinguish this condition of the system are so plain, and the appearance of an ill conditioned and flabby wound deluged with matter, and sometimes blackened with exuding blood, is so peculiar, that I hold this notice to be enough ; only it will be right that I explain to you, before I descend to the particular rules of practice, how terrible the consequences of ill air are, whether in hospitals or in a camp.

It is very well known, that in the autumnal months, in marshy situations, in crowded hospitals, in besieged cities, where the whole country is driven in upon the town, wounds will never heal. Parcé says\* that, in the siege of Rouen the air was so noxious that no wounds would heal ; and the besieged, finding that all their wounds became gangrenous, reported that the besiegers had poisoned their balls ; the besiegers also, seeing none but putrid sores in the camp, believed that their wounds were poisoned ; and, both within and without the city, such was the state of the air, and so

\* P. 264.

putrid were all wounds, that the surgeons could scarcely look upon the fores, or endure the smell ; and if they neglected them for a single day, they found them full of worms.

The history of one great hospital, the Hotel Dieu of Paris, which has been, I fear, an evil rather than a blessing to that city, has always appeared to me very curious.

Parée, 200 years ago, complained that in the Hotel Dieu fores would not heal, and no operations could be rightly performed. After him Diouis, 100 years ago, protests against performing operations in the Hotel Dieu ; and advises, that an hospital should be built in the environs of the city, for those who, having fractured skulls, required the operation of the trepan. And Mr. Desault, late surgeon of the Hotel Dieu, said, that wherever he performed the operation of trepan, his patients were sure to die ; by letting them alone they had some little chance of living. In his time, therefore, they tried to relieve compression, or coma, by bleedings, poultices, or blisters, but never ventured to perform the trepan.

The two great rules, then, which I have laid down for you are these : To bleed only in the spring, when men are just come into the field full of young blood, lusty, and strong, disposed to inflammatory diseases. But in the autumnal months, in marshy situations, in crowded hospitals, or unhealthy camps, when the men, having been exhausted with a long campaign, or having struggled through lingering wounds, you look only for weakness and fever, gleety stumps and foul fores ; instead of bleeding, you must trust to air and cleanliness, and bark and wine.

This single principle will, I hope, make the whole business very plain to you ; for, indeed, if a young man, without some leading principle, enter upon these duties ; if he go into the camp with only some looser notions of bleeding in inflammation, or of bark when gangrene is to be feared ; he will be little valued there : if he do not understand the connection betwixt the particular wound and the general health ; if he do not know with a glance the constitution of a patient, or the true state of his sore ; if he be not careful to retain some general principle, which, like

a myſtic clue may lead him through this labyrinth ; he will ſee thouſands dying around him, without knowing the cauſe, like the fable of the Grecian camp, falling under the inviſible ſhafts of Apollo.

This general view will reduce your notions of practice into a ſimple and manageable ſyſtem, and let you know what you are doing. You muſt always keep your eye upon the conſtitution of your patient, for there are many things more important to his health and ſafety than dilating his wound, or extracting the ball.

I. IF your patient be an officer, well fed, and warmly clothed, in full health, riding perhaps a pleaſant journey while his men are marching, and living luxuriouſly while they are ſuffering the hardſhips of their way of life, he will bear bleeding well.

II. If a raw ſoldier be wounded, who has come from home but lately ; who has lived in garrifon, and at his eaſe ; who is full of young blood, and has what Sir John Pringle has called the conſtitution of ſpring ; he alſo will bear bleeding.

III. You ſhould bleed very freely in wounds of the belly, head, or breaſt, or great joints ; but there is no need of bleeding in a mere fleſh-wound, where inflammation never runs high ; and you ſhould be ſparing of the patient's ſtrength in fractured limbs ; for, though there be inflammation at the firſt, it is to be ſucceeded by long confinement, tedious exfoliations of the bones, and a profuſe diſcharge.

IV. If a patient have lain long with gleeing wounds, and a malignant ſore ; if this ſore burſts out from time to time, & will not heal ; it will, too often, be explained to you, by the general air of the hoſpital, or by the habit of the patient's body : but if there be no ſuch cauſe, you will then renew your ſearch for balls, or pieces of cloth, or ſplinters of bone.

V. But if you attend cloſely to the conſtitution of your patient, and the air in which he lives, you will find in the ſoldiers who have lain long in your hoſpitals every mark of weakneſs ; you will find pale & flabby wounds, gleeing ſores, exfoliating bones, and ſtumps that will not heal ; you will find, on the other hand,

as the causes of these, frequent fevers, hectic, diarrhœa, night-sweats, profuse evacuations from the wounds, which, as Ranby expresses it, “run the patient out of the world :” and, in exigencies like these, you will find opium the best remedy for the diarrhœa, wine, and spirits of vitriol for the gleetings sores, bark for the febrile paroxysms, and air and cleanliness for the general health. Attributing much of their dangers, and sufferings to the tainted air, you will drive all loiterers from about your hospitals, and those who are really ill you will try to send early home ; and considering the duty and the feelings which press upon you at such a time, you will risk all patronage for yourself, to procure conveniences for your soldiers ; you will dare to offend, where it is necessary, in a right cause ; you will spare neither sollicitation nor remonstrances ; you will be steady and persevering, but still respectful to those who are over you in command ; respectful, not from any fear of your own interest, but from a manly sense of subordination and service, and a sincere desire of gaining your end, which is easily attained by a winning manner, but never by that conduct which is too apt to be felt as rude or mutinous, by those who are in command above you.

But, above all things, learn to refrain from after complaints ; for, at the end of a war, they sound too like the murmurings of those who are disappointed of the profits of it, and ill become the character, which you should endeavour to support.

DISCOURSES  
ON THE  
NATURE AND CURE  
OF  
WOUNDS.

IN TWO VOLUMES.

~~~~~  
BY JOHN BELL, SURGEON.  
~~~~~

FIRST AMERICAN EDITION.

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VOL. II.

OF PARTICULAR WOUNDS.

OF WOUNDS OF THE BREAST.

OF WOUNDS OF THE BELLY.

OF WOUNDS OF THE HEAD.

OF WOUNDS OF THE THROAT.

§ OF DANGEROUS WOUNDS OF  
THE LIMBS.

§ OF THE QUESTION OF AMPU-  
TATION.

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1807.



EDMOND GOODWYNE, M. D.

THIS SECOND VOLUME OF DISCOURSES ON WOUNDS,

IS PRESENTED BY THE AUTHOR,

AS A TESTIMONY OF RESPECT .

AND AS A SLIGHT ACKNOWLEDGMENT

FOR THE

INSTRUCTION AND PLEASURE DERIVED FROM HIS

TREATISE ON RESPIRATION.

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# DISCOURSE I.

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## OF WOUNDS OF THE BREAST.

**H**AVING passed through all the intricacies which belong to the general treatment of gun-shot wounds, we now advance to the more plain and easy doctrine of individual wounds: And in discoursing upon wounds of the thorax, it is natural, first of all, to reflect upon the very important parts which are contained there,—the heart, the lungs, the great vessels, the thoracic duct: We cannot but wonder, that wounds of such a cavity are not always mortal; but still more must we be surpris'd at men escaping easily from the most desperate wound of the lungs; surviving for many hours, or even days, where the weapon had absolutely touched the heart itself. But wonder is ignorance, and as our knowledge advances wonder subsides; for, in a subject like this, we compare the structure of the parts with the consequences of the wound, so as to arrive by slow steps at a knowledge of the true proportion betwixt the wound and the dangers; and all that was wonderful at first, vanishes in the end.

We know that the chest contains the heart, the lungs, the great arteries and veins. We know that if the heart or great vessels be wounded, there come on coldness, fainting, oppression, a total sinking of the pulse, paleness, and death; that if the lungs be wounded, there is an emphysema, or a breathing of air into the cellular substance, spitting of blood, difficult breathing, suffocation, and death; and if the patient outlive the danger, we expect pains in the chest, distress in breathing, dreadful cough, spittings of blood, restless nights and fearful dreams; and there will be, from time to time, hopes of recovery, followed by frequent relapses, threatening death; and we are besides, during all this suffering

and pain, obliged to use bleedings, so profuse as to be almost as dangerous as the wound itself.

If still our patient escape these early dangers, there are others, slower in their progress, but perhaps not less to be feared. There come next, tedious suppurations of the chest, with discharges of broken ribs ; then the wound swells, and the matter is confined ; then a deluge of matter bursts out at last after long suppression,—it bursts out with a temporary relief ; but the discharge continues so profuse, that weakness, fever, confirmed hectic, ensue, which hectic, unlike the true consumption of the lungs, is sometimes cured.

Sometimes also, it happens that the outward wound heals when all is not sound within : then matter forming oppresses the lungs, and the patient labours so much in his breathing, that if the making an opening for that matter, either be not proposed, or be not allowed, it collects in such quantity, that the whole breast is disordered and oppressed, and the patient dies.

Thus we have before us in one view all the dangers of wounded lungs ; oppression and suffocation at first ; after that, high inflammation and pain ; then long continued suppurations and wastings of the lungs, so that a small bud or tubercle only is left of them ; and, in the end, great oppressions from effusions of matter or of blood. We feel that wounds of the lungs are most interesting, from their dangers ; from our seeing the cause of danger so plain and open ; from our giving such immediate relief, sometimes by a bold use of the bleeding lancet, sometimes directly by the immediate touch of the knife, to make way for the matter or blood.

I have already hinted at a thing really wonderful, that the thorax, containing the heart, lungs, and great vessels, should be so often wounded with so little danger. Many no doubt die, but numbers escape ; for a wound of the substance of the lungs is far from being mortal. The blood may suffocate the patient ; the fever and pain may waste him ; he may die of the inflammation, or of the oppression of the lungs ; or there may be time for a

large suppuration, or a lingering hectic to cut him off ; but still, if his wound be only in the edges of the lungs, he is in some degree safe ; he is only in danger when the thick substance of the lungs is perforated, and falls into abscess, or when the root of the lungs is wounded, for there the large vessels of the lungs being opened, the great effusion of blood, like that from a wound of the heart itself, must kill, even by the quantity of blood lost to the general system ; but besides, this blood being thrown into the trachea, deluges the lungs, the patient spits up a frothy blood, blood instead of air occupies the lungs, so that he struggles for breath but a few moments, and then expires.

But still I return to the first part of this proposition, to that which ought to be the most particularly impressed upon you, that though no doubt many die, numbers do escape ; they often recover from wounds of the bayonet or small sword ; many recover also who have been shot fairly through the thorax, with fractures of the rib both before and behind, with many dangerous splinters of bone driven in upon the lungs ; some of those wounded with the small sword have hardly been ill, or have recovered in a few days ; and even those wounded with balls across the chest have recovered in a month.

When the lungs are wounded, the distress and danger of your patient must arise either from emphysema,—or from extravasation of blood,—or from the ball,—or cloth, or splinters of the ribs, either lying in the cavities of the thorax, or absolutely sticking in the lungs : But besides these present dangers, there is a second train of dangerous symptoms, which you must also learn to manage, especially long continued suppuration in the breast,—callous sores,—exfoliating bones,—or (the wound having actually closed) there may be collections of pus within the chest, and the operation of empyema may need to be performed. If I should discuss each of these points, I think that you would be bold and skilful in managing such a case.

## I. Of BLOOD poured out into the Cells of the LUNGS.

When a man is shot through the lungs, if death be very near, it must be from suffocation ; and you will find him with a bloody foam at his mouth ; his face pale in the cheeks, and livid round the lips and eyes ; heaving the breast with intolerable anguish ; tossing from side to side in bed ; the bloody foam increasing ; the breathing becoming more difficult, and the blood and air rattling in the throat ; then the pulse flutters, and the extremities continually grow colder, till (struggling, in something like a convulsion) he expires.

If you find your patient spitting blood and breathing high, but not much oppressed, or his oppression increasing very slowly, you may hope to save him. If there be no great vessel wounded in the lungs, so as to suffocate him at once, it is probable that the smaller vessels which are opened by the wound, will gradually cease to bleed ; and after four or five days of alarming cough, with bloody expectoration, that symptom will cease ; and in order that he may the sooner be relieved from his danger, you must bleed very freely : let it be your intention to reduce him very low by quick bleedings ; and let these bleedings have the effect of continued internal hemorrhagy, without the dangers of it : let them depress him to the same low condition to which the inward bleeding would most likely have brought him ; and the system being emptied in this direction, there will be less danger of immediate suffocation in the lungs, and but little fear of the succeeding inflammation rising too high. It is only by these repeated bleedings that the patient can be saved : you must keep the vascular system low in action, and so drain it as to prevent the lungs from being oppressed with blood.

One thing is very clear, that if you bleed only when the cough and bleeding from the lungs return, you never can do wrong ; for this is the plain matter : The patient lying struggling before you, is to lose a given quantity of blood ; if it be allowed to flow out into the lungs, he may be suffocated ; if you draw it from the arm, this suffocation is prevented ; if you keep him low



enough by bleeding, there will be no blood to spare for this extravasation into the lungs ; if you bleed only when the bloody extravasation returns, you are taking no blood away but that which you cannot save ; and thus you see, that it is only the most profuse bleeding that can keep your patient from suffocation ; and *that* will be established in your mind as a rule of sound practice, which seemed shocking and dangerous, when mentioned in explaining only the general nature of wounds ; you will feel, by such cases, that the French surgeons (with all their partiality for bleeding), could hardly, in such a case, go too far.

## II. Of BLOOD poured out, not into the Cells of the LUNGS, but into the Cavity of the CHEST.

The next cause of suffocation, is blood thrown out into the cavity of the thorax, not into the cells of the lungs :—it is less dangerous and more easily relieved ; and it may proceed from one of two kinds of wound, either from a fractured rib having torn the intercostal artery ; or from blood coming, not thus from the walls of the thorax, but from the lungs, which often bleed out into the thorax, as well as upwards into the throat.

If the blood which oppresses the lungs come from the lungs, then it is attended with a foaming of blood at the mouth, and a continual cough ; if it come from the intercostal artery only, then there is no coughing of blood, but an oppression increasing every hour. In either case the patient is in a melancholy condition ; and indeed this oppression from blood merely, gives him all the appearance of one who is wounded in some of the great vessels, and soon to die. The patient, in a few minutes after he is wounded, begins to be oppressed ; he cannot lie down ; he sits in bed raised up with pillows ; he often starts up in great agony, crying out that he is suffocating : he draws his breath with great contortions and writhings of the body, with anxiety and fear of instant suffocation, such as cannot be described ; he draws his breath with contortions and great effort, and yet receives not half his quantity of air ; his voice begins to be obstructed, his face be-

comes livid, his eyes turgid, his extremities cold, his pulse oppressed, quick, and fluttering ; there is a rattling in his throat, and his forehead is bedewed with a clammy sweat.

If the patient be not in the hands of a skilful surgeon, he will surely die. But when the surgeon thrusts in his finger to search the wound, he feels hot blood ; it follows his finger ; even the getting out a little blood in this way is a relief, and the patient is fully relieved by a more regular emptying of the thorax : often, the surgeon seeing that blood follows the finger, and being sensible of the true cause of this oppression, brings his patient over the side of the bed, as in tapping for the dropsy, makes him support himself upon his hands, and hang with his head reclined ; by this dependent posture the blood issues from the breast, and he is for the time relieved, breathes more calmly, returns to bed, lies quietly down, and continues in tolerable ease for twelve hours, till, perhaps, the blood flowing from the wounded artery, fills the cavity of the thorax slowly, and the breathing becomes again difficult in proportion as the breast fills : he is again put into this distressing posture, and again the thorax is emptied of its blood ; and thus, from dressing to dressing, he is relieved and kept safe from suffocation, till at last this inward bleeding ceases, and allows the wound to close.

It is not merely the laying the patient in this posture, that will always relieve the breast ; the blood flows with extreme difficulty ; sometimes coughing, or the patient's endeavours and strainings help to empty the chest, the putting the finger into the wound always assists ; the flowing of the blood is made extremely easy when a large canula is introduced into the wound ; any tube that is most at hand will serve ; on many occasions, the surgeon has found even so small a tube as the catheter of use. But why should so harmless an operation as this be spared ? Let a large canula be introduced into the wound, at every dressing, every twelve hours, oftener if the breathing be oftener oppressed, and repeated daily, till the blood, becoming gradually paler, ceases to flow. If a ball have passed through both sides, the danger and oppression will be very great ; and both sides of the thorax must

be freed of blood. If the oppression comes on instantly, there is danger lest some great artery be wounded ; if it come more slowly, but at last arrive at that degree which the patient can no longer bear, it is clear, from the slowness, that it is some smaller vessel : If there be oppression of the breast, without bloody expectoration, the bleeding is from the intercostal artery only, and there is no wound in the lungs.

Whatever may be the cause of this inward bleeding, these are your RULES : First put in your finger ; perhaps it may discover, or may evacuate the blood :—If the blood do not follow the finger, then some tube must be introduced, and the tube for so simple a business need not be a nice one : If you cannot get your tube into the thorax, and the breathing continue oppressed, you must enlarge the wound, and enlarge it freely ; to be afraid of exposing the lungs to air when they are already torn with a bullet, and loaded with blood, is mere childishness, and useless theory, very unlike the proper management of such wounds. If you find the wound in the thorax too high, above the third or fourth rib ; and if you find that no postures of the patient, however willing or able to turn himself, will bring the blood easily in that way ; or, if you find the wound confused, oblique and difficult for you to dilate, you must do an operation which, as it is commonly practised for pus in the breast, is called the operation of *EMPYEMA* : that is, you must make a very free incision in the line betwixt two of the ribs, then puncture the pleura with a lancet, and introduce your tube there ; or, in plain language, whenever you find that the natural wound will not empty the thorax, you must not fear to make a new wound, and you will make it in what is called the chosen point, the point of election, *i. e.* low betwixt the seventh and eighth rib, that there may be an easy drain. But whenever the wound is about the middle of the thorax, dilate it rather, which both changes the nature of the wound and gets out the blood. When this blood proceeds from a wound of the intercostal artery, such free incisions are the more necessary ; they allow us to see the artery, to feel the jet of its warm blood, by putting in

the finger, and this allows us to press it with a compress, or to tie it with the needle and thread.

III. Of EMPHYSEMA, or the Tumor formed by Air blown out from the Lungs into the common cellular Substance, or confined within the Thorax and oppressing the Lungs.

The emphysema is very frequent after fractures of the ribs, and sometimes follows common wounds. It arises from the air escaping, first, from the lungs into the thorax; then, from the thorax, through the wound of the pleura made by the fractured rib; then, from the cellular substance, which is over the rib, passing along till it inflates the cellular substance over the whole body. It is more frequent after a fractured rib, because there is there a wide laceration of the lungs, and no exit for the air; it is less frequent in large wounds with a knife or broad sword, because there the air has an open and unimpeded issue; it is again more frequent in deep stabs with the bayonet or small sword; and it is peculiarly frequent in gun-shot wounds, because the orifice in the skin inflames and swells, while the wound is wider within: We often find an equal degree of emphysema at both wounds, *viz.* that where the ball entered, and that by which the ball passed out, and we need to make scarifications at each wound, which we do the more willingly, because such scarifications empty the windy tumor of its air, and, if necessary, they can be made such as to empty the thorax of blood, or to give room for searching with the finger, and extracting the splintered bones.

This emphysematous or windy tumor is one of the strangest accidents that happens in wounds of the chest: It advances so quickly, swells the whole body, closes the eye-lids, puffs up the scrotum, and all the looser parts, with such alarming rapidity, and is attended with such oppression of the breathing, as to terrify the patient; and the surgeon himself, though he knows it to be a slight matter, compared with the apprehensions of the sufferer, is yet not entirely at ease. In short, it is a symptom which is so particular, and in some circumstances so dangerous, that it requires a very full explanation.

When a rib is broken, the point of the broken bone is pressed down upon the surface of the lungs and touches them : It abrades and lacerates the surface by the continual motion of the thorax ; and it is often from the slightest and most superficial wound of this kind, that the emphysematous tumor proceeds ; for, in most cases of emphysema, the laceration of the lungs is so superficial, that it is not even attended with the least degree of bloody foam from the mouth, or any other symptom of a deep wound ; and, if the patient die, the wound cannot be seen even after dissection, but is only to be found by inflating the lungs : Yet the surface of the lungs being touched, even in this slight way, the air escapes from them at every inspiration ; the air which is then within the cavity of the thorax, is of course compressed, so that at the next expiration, this compression must force the air either back again into the lungs, or out by the wound in the walls of the thorax, and so in among the cellular substance which surrounds the broken rib. Thus in every inspiration there is a suction of some air, which is drawn through the wounded lungs, the air expands into the cavity of the thorax, the lung which gave out that air subsides again, and lies almost entirely quiescent, partly from the wound in it, which, like a rent in a bladder, prevents it being inflated, and partly from the oppression of the air within that cavity, where there should be a vacuum to cause its distention ; so that in the first inspiration, air is drawn in through the wounded lung, in the next inspiration it is breathed out through the wound of the thorax : Every new inspiration draws more air from the wounded lung, and every new expiration drives more air out into the cellular substance ; there is no farther outlet for the air, which makes its way forwards, undermining the common skin with wonderful rapidity ; so that the emphysematous crackling tumor appears, first, over the broken rib, or over the wounded point of the thorax ; then extends over the whole chest, (oppressing the breathing) ; then over the neck and face, filling particularly the eyelids, so that the eyes are absolutely closed ; then over the belly ; then down the thighs ; the private parts are at last enormously swelled ; and no part escapes this tumor, except the palms of the hands, and the soles of the feet :——more air is every moment



drawn out from the wound of the lungs, and driven under the skin ; the patient is every moment more and more oppressed ; till at last the breathing is quite interrupted, the pulse flags, the extremities grow cold, and the patient, if he be not relieved by some operation, must die.

The philosophy of this disease, if I may be allowed to say so bold a thing, is quite misunderstood ; and it happens very strangely, that the most palpable blunders are to be found in the writings of those who are looked up to as oracles on this point, and who boast of their discoveries, and claim them as their own, with an eagerness which would imply something very important. But perhaps the easiest form in which I can deliver this question to you is, by explaining first in my own way the real condition of a wounded lung.

The moment that the lungs are wounded they fall down, and continue in this collapsed state until the wound heals, which it does in the course of a very few days : but from the moment in which the lungs are wounded, the use of the wounded lobe is lost, so that if the wound be in the right side of the lungs, the breathing is performed only by the left, only half the quantity of air is inspired, and the breathing is difficult : But, this collapsed state of the lungs, which cannot be remedied, which must inevitably continue at least for a few days, while it is a cause of distress, is at the same time a chief means of safety. When the lungs are unfolded, their vessels have their full diameter, they hold their full proportion of blood, and if, after being wounded, the lungs could continue dilating at every respiration, their wounded vessels would throw out much blood ; but the moment that they are wounded, they fall down to the back bone, they continue in this collapsed state, and can no more be filled than a torn bladder can be inflated ; and moreover, they are oppressed by the thorax being filled within with blood or air, and this collapsed condition of the lungs prevents much loss of blood : There is less blood thrown out into the cavity of the thorax to oppress the lungs, and there is also less thrown into the bronchia, which is still a more dangerous kind of bleeding, since it threatens suffocation, not only by filling the

wounded lung with blood, but by affecting both sides of the lungs.

If the lungs, when wounded, were to continue in perpetual motion, I do not know how we should expect a cure ; for the air would be continually streaming through the wound, and the wound itself, alternately dilating and contracting like that in an artery, could not heal. But as the wounded lung lies in a collapsed state, the edges of the wound are in contact with each other : There is, as we find by dissection, a slight effusion of blood, a degree of livor, a swelling, thickening and inflammation round the wound, and thus, in two days, the wound heals. It is healed partly by adhesion, partly by this thickening of the cellular substance round its edges ; and thus the lung becomes once more entire, and its function is restored.

The blast of air from a wound in the thorax, is often so strong, that at every breath it will extinguish a candle, and rushes with considerable noise. This strong blast of air, so far from being a sign of wounded lungs, is often strongest when the lungs are absolutely entire ; it is a sign of a free and open wound in the thorax, but by no means of wounded lungs ; for whether the lung be or be not wounded, the air enters so freely by the outward wound that there is no vacuum formed to give them play, and therefore they fall down and lie collapsed till the outward wound heal. The thorax therefore has nothing to do with the lungs, but is like a pair of bellows, having a large air-hole, which admits the air every time the breast rises ; and when the breast falls again, that second motion blows it out. The air is alternately drawn in, and thrown out at every respiration, with a strong blast ; but whatever air issues through the wound, had been drawn in by the wound, and had never passed through the lungs : There is no vacuum to move the lungs. The lungs, whether they be entire or whether they be wounded, always lie collapsed.

That the lung of one side which remains unhurt, is sufficient to support the system, we learn from various accidents : From those cases in which, either owing to the incisions made by the surgeon, or to the nature of the wound, the chest has lain quite open, and

the lungs of one side quite collapsed, and where the patient has yet lived in tolerable ease in the mean while, and recovered perfectly in the end. We learn it also from cases of emphysema, where the lungs are oppressed with air, and from cases of empyema or pus, within the cavity of the chest, obstructing the expansion of the lungs ; and especially we are sure of it from the very gradual decay of those who die with large suppurations within the chest, in whom we find, after death, that on one side there remains nothing but one small knob or tubercle of the lungs\*.

That the breathing should be easier in a free and open wound of the chest than in a punctured wound, or that, in the case of a punctured wound, the patient should be relieved by a free incision, no one needs wonder ; for, in a punctured wound, there is no way for the blood or air to escape from the thorax, while yet at every stroke of respiration more and more blood and air is drawn out from the lungs, till at last the blood, and especially the air, are so condensed, that they not only oppress that side of the lungs, but by hindering the free play of the diaphragm, and loading the mediastinum, they oppress also the other lung, until at last the breathing, every moment more oppressed, falls lower and lower ; the pulse also sinks in the same proportion ; the extremities grow cold ; cold sweat bedews the forehead ; and after great tossing, and undescribable anxieties, the patient dies : But in a free and open wound, or when we make a free and open incision to relieve this distress, we relieve not the oppressed and wounded side, but the sound side of the lungs, and all goes on tolerably well ; till the incision heals, and the function of the wounded lung is restored.

If this reasoning be just, then, instead of trying to get out the air, or hoping to restore the office of the lungs, we should wish the lungs to lie in this collapsed state ; it is the best security against

\* Sectione suscepta, dextrum pectoris cavum invenimus pure oppletum tenui, viridescente, materia copiosa alba, quasi sebacea, dorsum imprimis et diaphragma versus mixto, quæ a pulmone suppurato producta videbatur. Pulmonis verò ne vestigio quidem reperto, asperam arteriam investigantes illamque ad bronchiorum divisionem persequentes, in mediastinum hanc abire conspiciebamus. KOELPIS, *de Empyemate dissecti*, p. 135, 136.

dangerous bleeding, their evolution is not absolutely necessary for the patient's breathing, their continuing in this collapsed state is the surest means of healing the wounds in them. In short, this collapsed state of the lungs is one of those happy accidents, inseparable from the constitution of the part, which so obviously facilitates the cure, that we attribute it to a regular and fixed design of nature.

How impossible it must be to raise the wounded lung, and to renew its function, I think I shall now very easily explain, demonstrating to you at the same time, that those who have intended this effect by their free incisions, had not founded their discoveries as they have prematurely called them, on good principles ; for Bromfield writes very ignorantly in that chapter, where he tries to reclaim the invention from Hewson. Hewson again is as vain of this trifle as if he were not rich in discoveries really honourable ; and Mr. Benjamin Bell, the most excusable of all, follows them in the humble labour of gleaning and gathering up their mistakes.

First then, Mr. Bromfield tells us, with great confidence in his own opinion, and great scorn of all others, " That the wound of the lungs being ascertained, one would not imagine that any person, skilled in the true cause of the complaint, and in the danger, with a thorough knowledge of the parts, could be at a loss for an attempt *to relieve* ; for in case an opening is made between the ribs, and a canula introduced, whose diameter is larger than the wound of the lungs, the air will be forced out as fast as it escapes from the lungs, therefore the lungs will have *room* for their *expansion*, and the danger of suffocation will be removed ; and when once the wound of the lungs is agglutinated, and the canula withdrawn, the external opening will be healed without any difficulty \*." The notion of the thorax being exhausted of air, before, according to the author's expression, the wound of the lungs is agglutinated, is curious. The expression, " the lungs having room for their expansion," is still more curious ; but if

\* Page 91.



any one should doubt whether the author could intend to say so foolish a thing, as that the lungs, not being opposed, will dilate of their own accord, let him turn over to the next page, where he will find a remark, coupled with a fact, which is most curious, *viz.* “ I remember a similar happy effect, in accelerating the cure in a similar case by the PATIENT’S PLAYING ON the HAUTBOY, which, keeping the lungs forcibly distended for a long while together, kept the pleura closer to the ribs, so that the union of the separated parts, (*viz.* of the pleura and ribs), was most likely sooner effected than if he had trusted to the ordinary respirations.”

The celebrated Mr. Hewson hardly reasons more correctly than his competitor Mr. Bromfield \*, who so kindly permitted him to make himself known to the Society. “ It is natural,” says Mr. Hewson, “ to suppose, that the wound of the pleura and intercostals may sometimes be too small to suffer the air to get readily out into the cellular membrane, and to inflate it, but may confine a part of it in the cavity of the thorax, so as to compress the lungs, PREVENT THEIR EXPANSION, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation which water does,” p. 347. Through all his paper we find him, in speaking of oppression of the lungs, referring only to that side which is wounded. He never once mentions the oppression of the diaphragm, or the pressure on the mediastinum, nor does he in any shape hint to us the oppression upon the lung which is sound ; and, in the passage which I have just quoted, he says, that “ the air within the thorax prevents the expansion of the lungs ;” and, in directing how the incision is to be made, he advises, that it be small, rather than large, “ for penetrating wounds of the chest are inconvenient, on account of the air’s entering by the aperture in such *quantities* as to prevent the *expansion* of the lungs.”

\* Mr. Bromfield says very candidly, “ Though I should have been sorry to have prevented Mr. Hewson’s making himself known to the Society, by a remark which he thought new,” &c. ; but Mr. Hewson had many ways of making himself known to the Society, which Mr. Bromfield had *nothing* to do with : He was among the number of those who shared the merit of that most beautiful of all discoveries, the Lymphatic System.



\*The tendency of all this is very plain ; but it is only in the writings of Mr. Benjamin Bell, that one can have a perfect abstract of this opinion, which all of them had some faint notions of, but which he alone has obtained in perfection. He says \*, “ In the chapter above alluded to we have mentioned different methods of expelling the air *from the surface of the lungs*, but the simplest and easiest is this : While the wound yet remains open, let the patient, in a slow gradual manner, make a full INSPIRATION, by which a considerable quantity of the collected air will be discharged †. This being done, the skin must be instantly drawn over the SORE, so as to cover it completely during EXPIRATION ; and if the wound be moderately opened during INSPIRATION, the whole quantity will be soon expelled.” This receipt, for expelling air from the lungs, comes very naturally from the author, by whom we are told, in the chapter alluded to, “ that when a violent exertion in coughing, crying or laughing has produced it, (*viz.* bursting of the lungs) the particular seat of the complaint will, in general, be pointed out by some degree of pain in the part where the rupture of the external coverings of the lungs *have* occurred.”

Now, whatever interest this author may have in persuading his reader that laughing is dangerous, and that the lungs may be burst by immoderate laughing, I cannot forbear wishing, that he had satisfied us so far, as to have mentioned at least one accident or fact of this kind.

\* P. 207.

† My reader, although he should be the merest tyro in philosophy, will know, that when a man inspires with a wound of his thorax, if that wound be larger than the trachea belonging to that side of the lungs, though he may by INSPIRING draw air into the chest by the open wound, he can throw none out ; in short, inspiration must always draw in air, both by the opening of the chest, and by the opening of the trachea, and expiration must blow it out if it will go. INSPIRATION and EXPIRATION are the same with regard to the opening of any wound, that they are with regard to the trachea : therefore Mr. Bell has just repeated a boy's lesson with a boy's fault in it, calling inspiration expiration, and expiration inspiration.

“The other means which we wish to propose (says Mr. Bell) for drawing off air from the thorax, is Suction : An exhausting syringe may be fitted with such a mouth, of ivory or metal, as will allow it to be closely applied over the orifice in the pleura.” And again he says, That “as much distress has, on some occasions, ensued from both cavities of the chest being at the same time laid open, it ought never to be attempted.” And the reason given for these inconveniences, and the kind of danger that is apprehended, is not that the lungs of both sides would collapse, and breathing cease, and the man die ; but it is this, that the two cavities of the chest being laid open at once, and the air being admitted into both cavities at once, both cavities would inflame at once, and that would produce “MUCH DISTRESS.” That it might produce much distress among his friends, I will readily allow ; but as for the patient’s own immediate distress, that, I believe, would be soon over, and there would be little time for relieving him by sucking up the air, with an elastic gum-bottle, from “the surface of the lungs.”

But the serious and plain conclusion is this, that the lungs will continue giving out air till they heal ; that while they are giving out air, they must lie collapsed ; that it is not desirable that they should be moved, for their lying unmoved is the best security against bleeding, and the surest way of making the wound of the lungs heal : And still farther, we cannot, if we would, raise the wounded lung, nor renew its function ; it is rent so that it cannot be inflated ; it is oppressed with air if the chest be close, or if the chest be open, the air passes in so freely that no vacuum can be formed to move the lungs ; and as for inspiration emptying, and expiration filling the breast, it could never have been spoken of but by a person who could talk about the lungs being burst with laughing. The incisions which have been so much commended, are useful, not by raising the wounded lung, or renewing its functions ; for that attempt is absurd in all respects ; it is needless, because, though a man does not live so easily, yet he does live, and does well with one lung only (I mean breathing only with the lungs of the one side) till his cure be completed : It is im-

possible to accomplish it, because the wounded lungs being still open, the matter, air, or blood, issuing from that wound, fills the thorax, and prevents a vacuum : It is useless also ; for it is, as I conceive, desirable, that the lung should lie collapsed and quiet till the wound in it heal ; and, therefore, those free incisions, which I approve of as much as Mr. Hewson could do, are useful only where the breast is much oppressed with accumulated blood or air ; and the incision which lets out that blood or air, also lays open the thorax, so as to let in the air freely, so that this free incision serves at once two good purposes ; it makes the wounded lungs collapse entirely, and sets the lungs of the sound side quite free, by relieving the diaphragm and mediastinum from the pressure of extravasated blood.

The practice then, in the case of emphysema, should be this : 1<sup>st</sup>, Upon observing the crackling tumor beginning to form itself over a fractured rib, you should make small punctures with the point of a lancet, as in bleeding ; and if the point be struck deep enough, the air will rush out audibly. But, as this air was in the thorax before it came into the cellular substance, it is plain that the thorax is still full, and that the lung of that side is already collapsed and useless, and must continue so : The purpose therefore of making these scarifications, and especially of making them so near the fractured part is, not to relieve the lungs, but merely to prevent the air spreading wider beneath the skin.

2<sup>d</sup>, If, before you arrive, the air shall have spread to very remote parts of the body, as to the scrotum, and down the thighs, it will be easier to make small punctures in those parts, to let out the air directly, than to press it along the whole body till you bring it up to the punctures which you may have made on the chest over the wounded part.

3<sup>d</sup>ly, If, notwithstanding your free punctures, and your pressing out the air in this way, you should find by the oppression that either air or blood are accumulating within the cavity of the thorax, so as to oppress, not the wounded lung only, which was of course collapsed and useless from the first, but so as to oppress also the diaphragm, and through the diaphragm to affect the sound

lung ; then a freer incision must be made through the skin and muscles, and a small incision made delicately into the thorax, to let out the confined air or blood.

*4thly*, If it be a gun-shot wound, it will happen more frequently in that than in almost any other, that the wound of the lungs will heal very easily ; for, though there be at the first a bleeding from the wound, and an emphysematous tumor, a bloody foam at the mouth, a rattling breath, and apparent danger of suffocation ; yet these very alarming appearances soon change : For, in a gun-shot wound there is, from the bluntness of the ball, a sort of laceration, attended with an immediate swelling of the wound in the lungs ; there is an effusion of blood, or an ecchymosis all round that wound ; the wound of the lung swells and closes ; the lung is capable in some degree of inflation ; the rising of the lung keeps the wound of the thorax and the internal wound of the lungs so in contact, that they soon adhere. This therefore is a business which we should not meddle with nor interrupt : If emphysema extend rapidly from both the bullet-holes, then we may find it requisite to dilate them ; or if there be broken ribs, we may choose to get the splinters away : But if there be but a simple wound, no broken rib, no emphysema, little difficulty of breathing, and little spitting of blood, we should simply lay a piece of scraped lint upon each wound, put a gentle roller round the body, bleed the patient, and lay him quiet : for it has often happened, that a man thus shot through the lungs, from being apparently in the most imminent danger, has been restored in a fortnight to the most perfect health.

#### IV. Of Extracting the splinters of Fractured Ribs, Pieces of Cloth, Balls, or other foreign Bodies.

Our most immediate duty is, to relieve the oppression of the lungs, by getting out the air and the blood, and next to enlarge the wound, and take away the splinters of fractured bone.

If a ball have broken the rib, the pieces of the bone will be easily felt with the point of the finger ; the incisions should there-



fore be made such as to admit the finger easily, and to set all the splinters free ; the splinters of bone may be picked away with the points of the fingers, or loosened with dressing forceps ; the fingers should be put in to feel the course of the ball, or the damage it may have done ; and you should not at the first dressing believe your work entirely done ; more splinters may be sticking even in the substance of the lungs, supporting the suppuration, and causing a very pungent pain, and (just as in a fractured scull) you should be continually upon the watch to observe whether there yet remains any depressed bones injuring the lungs, and should endeavour in your daily dressings to feel them and to pick them out.\*

Beside the splinters of ribs, there are pieces of the clothes to be accounted for, as also the ball when it does not pass through. If there be a piece of any of the clothes wanting, as of the waistcoat, and if there be a profuse suppuration and increasing pain, it proceeds most likely from that very piece of cloth having been carried in by the ball. In this case, we may put in the finger or a long probe to search for it ; but it is by no means likely that it will be seen till the flux of matter wash it (after long danger and suffering) towards the wound. Yet we can in some degree imitate this operation of nature ; for a mild injection of tepid milk and water, thrown through the thorax with a rapid stream, will at least sweep the thorax clean of grumous blood, and if practised frequently at the time of dressing, will (if assisted by a proper posture) bring any piece of cloth to present itself at the wound.

As for the ball itself, if it be lost in the thorax, it is irrecoverably lost ; and no method that we can contrive will enable us either to find or to extract it : The matter cannot raise it towards the wound ; it will fall downwards upon the diaphragm, and either settle itself, forming a sac there, or cause a suppuration ; and when an empyema is formed, the incision which lets the matter out will also allow the ball to drop.

\* The introducing the point of the little finger, or of the fore finger, according to the size of the wound, does not interfere in any degree with our intention of closing the wound with a com-



## V. Of Supporting the Patient under the Profuse Suppurations.

The dangers of profuse suppuration are next to be apprehended ; for it very frequently happens that after a wound, and incisions like these, not only the dressings, but the very bed are drenched with matter, which, together with fever, cough, and violent pain, soon exhaust the patient. The first danger of suffocation is now over ; the bloody expectoration has ceased ; the strength is reduced to the very lowest ebb, more, it should seem, by our bleedings than by the wound ; and we are bound by every motive to support the patient through what remains of the cure. Now, as the cough is not to be appeased by bleeding, we give large opiates to quiet it, and to procure sleep ; we give bark, to keep up the suppuration kindly, and to make the wound heal ; and we try to support the patient's strength by foods easy of digestion, and especially by soups, jellies, and a diet of milk.

If it should unfortunately happen that the wound closes while all is not found within, the formation of matter will be foretold by shiverings ; the actual formation of it will be proved (as in any other abscess) by the cessation of fever, and abatement of the pain ; and when it is fully formed, it will be felt by a weight upon the diaphragm, and anxious and difficult breathing ; and these signs will increase with the quantity of the matter, till at last the matter can be felt by the patient himself, dashing within as he moves : The surgeon can discover it by tapping gently with his hand, and then also the patient will distinctly perceive that he cannot sleep but on the affected side. When all these signs appear, the operation of cutting the side should be boldly done, it will give a temporary relief, delightful to the patient, after that kind of anxiety and suffering which is the most distressing of all to bear. Sometimes, no doubt, in this case we can accomplish a cure, but too often the patient, exhausted with the evening hectic and profuse flow of matter, soon dies : he wastes away as in a consumption, and a few weeks close the scene.

press ; for the finger should always be introduced gently, and this way of probing should never be repeated, unless when we are sensible of there being many splinters of bone.

Thus have I considered the several points of practice, shewing you how to prevent suffocation, and to stop the bleedings in the lungs, by profuse bleeding from the arm ; how to get out extravasated blood, which lies oppressing the lungs, by enlarging the old incisions, or making new ones, and introducing a tube ; and how, by tying the intercostal artery, to stop that source of blood ; how to dispel the air of the general emphysema by slighter punctures, and when to make freer incisions in order to relieve the lungs. I have taught you how to pick away fractured bones ; get out pieces of cloth ; how to distinguish suppuration, and to perform the operation of empyema, and how to support your patient under the vast discharge.

But I have been accustomed to add to this kind of general lesson a particular representation, as if of an individual patient lying wounded, suffering the agonies, and struggling through the dangers, of his wound, and happily in the present instance this manner of summing up the whole subject, makes a very short and simple tale, not uninstruative.

Suppose, then, that you are brought to a man, who, being shot through the breast, is struggling for breath, and likely to die—you know that the great danger is from blood thrown into the cells of the lungs—you see him in danger of this suffocation ; you know it by his high breathing, and by the bloody foam which issues continually from his mouth ; you know that the only chance of restraining the blood is by bleeding in the arm, and you bleed him freely upon the spot. Then, in the course of a few hours, the emphysema appears, which blows up the wound, extending along the breast, and increasing in size with a rapidity which astonishes and alarms the patient—you then scarify, or rather puncture the wound, and press out the air ; but if the lungs become every moment more and more oppressed, you dilate the wound, so as to lay the chest in a manner open, leaving so free an exit for the air, that the emphysema cannot form again, nor the lung be again oppressed. This free incision admits your finger ; you feel for splinters of bone, and pick them away ; if the intercostal artery bleed, you secure it ; if there be blood filling the

thorax, which has come perhaps from the lungs, you get it out by changing the posture of the patient, or by the help of a tube, and then you lay a piece of oiled lint within the lips of the wound ; apply a large poultice over all, and so compose your patient to rest. At the next time of visiting, you find him again labouring in his breathing ; he has had a pungent pain in his breast, which indicates some splinter of bone still pricking the pleura or lungs, and so at every dressing you let out blood, and when warned by pain, you always feel with your finger for splinters of bone : On the first day pure blood is discharged, and it runs freely : On the second day still there is emptied from the thorax perhaps a pound of warm blood mixed with clots : On the third day the blood is serous ; and on the fourth, fifth, and sixth days, the bloody tinge disappears ; pure serum succeeds to it, and pus again succeeds to the serum, till there is established at last a regular purulent discharge.

From the 5th day the patient grows easier ; from the 5th to the 10th day, the bloody expectoration gradually decreases, till at last it ceases altogether ; from the 10th to the 20th day, the discharge from the breast decreases slowly, ceases at last, and allows the wound to close. But many interruptions will often cross you ; the suppuration often flows in a continued stream, and wastes the patient ; the fever often rises unexpectedly, with difficult breathing, oppressed lungs, and a profuse discharge : Sometimes you will find this accounted for by the irregularities of the patient ; but if such symptoms return from time to time, or if there be a profuse discharge, without any obvious cause, you must renew your search for foreign bodies with all possible diligence ; you see that the ball has gone fairly through ; you think that the splinters of ribs which you have drawn away, fully account for the size of the hole which you feel ; still, perhaps, you may be fortunate enough to discover one remaining splinter, which, however small, may have been the cause of all this distress, or by washing out the thorax with milk and water, from time to time, (which you need not fear to do, when you know it to be full of grumous blood, or acrid pus,) you may get away a piece

perhaps of the waistcoat, upon which the wound will quickly heal. Thus, by care and prudence, and a continual attention to the symptoms, and to the wound, you will have the happiness of bringing your patient safe through all his dangers and sufferings; thus the ways of nature and good sense are so plain and easy, that nothing but a strange desire of wandering into whimsical and artificial practices can carry one aside from so direct a line.

But that you may have warnings as well as examples, (and warnings are often of greater value than the best examples,) I shall next present you, not with this fictitious representation of an easy cure, but the real history of a case which I boldly hold up to you as an instance of the very worst practice. I say boldly, because I am venturing to criticise the practice of one of the first surgeons in France,—a practice acknowledged by the Academy of Surgery, and so, by implication, approved by all the surgeons of France.—I do not single out this case through mere wantonness, but because I think it really dangerous;—and when I shall have compared the bad practice, or what I think the bad practice, with the good, your judgment will be settled in one important point, so that you shall not need to pin your faith upon the authority of any author, or number of authors.—You will then see clearly, and may choose whether you will abandon yourself to what I will call a presumptuous interference, or rather hold to the simple ways of nature;—whether you will keep the wound open by main force of setons or tents, or allow it to heal, if it will heal, expecting it to continue open naturally, if there should be any cause why it should not heal;—for, although the wound should close upon some piece of cloth or splinter of bone,—such foreign body will produce matter, the matter will oppress the lungs, the oppression will require the operation for empyema; and that opening will allow at once the matter, and the piece of cloth, to escape.

An officer was brought to Mr. Guerin wounded by a ball, which had broken the 5th rib twice, entering before and coming out behind. Upon putting his fingers into each of the wounds,



Mr. Guerin felt many splinters of bone. He dilated both with free incisions, and took away many splinters of bone. The patient coughed up much blood,—his extremities were cold,—his pulse suppressed,—and there was such fear of suffocation, that Mr. Guerin could hardly be blamed for having ordered three bleedings during the night; bleedings were repeated the next day, and the cough and bloody expectoration being abated by the 4th day, it was plain that the patient was saved for the time, and that he had a chance of life. But here is the singularity of the management of the case; Mr. Guerin, after dilating the wounds, introduced a seton, which, of course, went as fairly across the breast as a bowstring crosses a bow, and this seton he continued to draw with a perseverance which is truly wonderful, from the first day to the 38th day of the wound; during all which time the patient's sufferings were dreadful. “From the fifth to the fifteenth day (says Mr. Guerin), I drew the cord regularly; for fifteen days the symptoms were not diminished, and in these fifteen days I was obliged to bleed no less than twenty-six times.” From the fifteenth to the twentieth, his patient was a little relieved; from the twentieth he grew worse, on account of a sudden movement of the army, being hurried onward to the city of Gand; from the twentieth to the thirtieth day he grew greatly worse; by the thirtieth day Mr. Guerin had completed the number of twenty-nine bleedings, having bled his patient, by computation, every day, with the intermission of one day only. On the thirtieth day the attendant surgeon found himself obliged to bleed once more; and the symptoms growing much worse, consultations were called, and about the thirty-second day the seton was removed; on the thirty-third day the patient complained of a pricking pain, and they were sure something must be wrong; they could not feel the splinter of bone, but resolved, after mature deliberation, to cut up the side; and accordingly, an incision being made, which joined the two wounds, and was seven inches long, and the whole thorax being now laid open, they saw betwixt two of the ribs the course of the ball along the lungs, and the groove which it had made in them. They found a piece of bone sticking



in the substance of the lungs, and having picked it out, this dreadful wound healed kindly, and the patient was saved.

From this case several reflections will arise, and you are already, I hope, so far surgeons, as to perceive that some steps of Mr. Guerin were bold and good, and what is still more, were very successful ; but that the main stroke of his surgery here, viz. the seton, was very wrong.

You will notice also, in this case, 1st, How freely you ought to dilate every wound, more freely if there be fractured bones, and that all the splinters cannot be removed at once. 2dly, You will remark how useful the five bleedings in twenty-four hours were, towards saving this patient from suffocation ; they were indeed the immediate means of preserving his life. 3dly, You will find in this case a strong proof of what I affirmed, that (after all that has been said on this subject) there is no great danger in exposing any cavity to the air. 4thly, You must remark, that where there is any very pressing danger, you ought to venture every thing, and that the bold incision of Mr. Guerin, which laid the thorax so freely open, did save his patient's life.

But, on the other side of the account, stands every thing that relates to this foolish seton ; for, had Mr. Guerin been asked what good it was to do, it would have been difficult for him to have invented even a plausible apology for a practice, which, if it was not doing good, could not fail to do harm. Was this seton necessary for keeping the wound open ? No, surely ; for the wound could not have closed while it was irritated and kept in suppuration by splinters of bone, and a piece of cloth within the breast. Was it to draw the piece of cloth out ? Surely, in the course of twenty days, a piece of cloth would have had some chance at least of being floated towards the wound, either by the natural flux of the matter, or by the help of a mild injection. Was it useful in supporting the discharge ? This would have been a fore question for Mr. Guerin ; for it supported the suppuration only by inflaming the chest ; and where inflammation of the chest, or high cough, or bloody expectoration, or a profuse discharge, were the chief dangers, a great seton could hardly be a

comfortable inmate in the breast. I think one might very boldly promise to produce bloody expectoration and terrible cough, profuse suppurations and oppression, to any degree, by drawing such a cord across a sound thorax.

And it would be a forer question still to ask, why did this gentleman never feel this pricking piece of bone till the thirty-eighth day ; did it strike or dart into his lungs only on that particular day ? I fear the reason of his not feeling it before, is but too plain ; the pain of drawing this harsh seton across the chest was such, that it deadened every lesser pain, and he could not feel the trifling pricking of a bone till his greater sufferings from the cord were allayed.

In short, Mr. Guerin passes a great strap of coarse linen across the cavity of the chest, and when it causes high inflammation, he thinks to subdue it by bleeding ;—when Mr. Guerin continued for thirty days drawing a coarse seton through the breast every morning, and bleeding for the cough every night ; what did he do, but raise inflammation with his left hand, to show how well he could subdue it with the right ? With this warning, which I am sure you will understand in its true meaning, I shall conclude my observations upon wounds of the chest. But in leaving this subject, I cannot refrain from representing to you, how close the connection is between good practice, and the knowledge of parts. To an ignorant man all is wonderful,—to a well instructed man every thing is plain and easy ; nothing passing within the patient, but what he calculates,—foresees,—prevents,—knowing both the dangers, and the safety of the case. If the patient spits blood, he fears a wound of the lungs ;—if there be an emphysema, he is sure of it ;—if his patient be oppressed, he fears lest there be blood within the chest ; and when he puts in his finger, he is sure of it, and relieves it ;—if there be sharp pains, he thinks some pieces of bone are sticking in the side ; and by searching for these also he gives relief ;—if there be a violent cough, he apprehends inflammation ;—if cough continue with rising pain, he is sure that inflammation is begun ; if, with cough and pain increasing, the patient is daily more oppressed, he is sure the inflammation is then

running dangerously high, and that his bleedings cannot keep it down ;—if the patient be attacked with shiverings, he foresees matter ;—if evening hectic come on, his suspicions are confirmed ;—if the breathing grows daily more oppressed, he is sure of matter ;—when the patient rests only on the left side, he is sure that the left side is full of pus ; and having traced by symptoms only up to this stage, he strikes gently upon the thorax, and hears the matter dashing with. ;—and thus, through all the stages of this particular wound, the man of real knowledge sees clearly every thing that is going on within.

## DISCOURSE II.

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### ON WOUNDS OF THE BREAST.

YOU would observe, at our last meeting, that I had begun to represent to you the absurdity of passing setons across the thorax. You will, perhaps, remember my late promise of explaining this matter more fully ; and I would not disappoint you of any explanation, that might be either interesting or amusing to you ; but, more especially, if such explanation concerned any great question, or could give you more determined notions, and a freer reliance upon your own judgment, in the affairs of practice ; and I am persuaded, that this will really be the effect of laying before you a short history of setons and tents.

Formerly, in speaking of setons, I observed that, for medicines to be introduced upon setons, one could conceive many which might be hurtful, but none that could be useful ; and, as for promoting the pus and shaking the bones, they would surely promote pus, just as splinters or balls would do ; and they would shake many bones which should not have been loosened. Yet these are the best reasons that the French surgeons have been able to assign ; and these have been assigned only because they had still a hankering after a practice, which had been handed down to them by their fathers, but which they felt needed this kind of support.

When we come to search into this business, we find the history of it to be plainly this : that as Guy de Chauliac, Parcé, and all the older surgeons, did not know how to dilate gun-shot wounds, they found these same setons useful in bringing the eschar sooner away, and in preserving an open wound ; and, as they believed the wounds to be poisoned, they took the opportunity of conduct-

ing, by these setons, whatever acrid medicines might, according to the prevailing doctrines of that time, have any chance of correcting the poison. This, as far as it regards the old surgeons, is a full and true account of the whole matter, and is in no shape deserving of farther notice ; but the doings of the modern surgeons, especially of the French, deserve some farther attention.

It is curious to see them attempting to vindicate, by reason, a practice founded on such prejudices as these ;—it is very surprising to observe the cruelty and perseverance with which they used to draw these cords through the wounded limbs ; and when the roughness of such a cord, or the acrimony of the drugs conveyed by it, produced a large suppuration (however painful), they were delighted with such proofs of their success.

We find the French surgeons passing their setons across the thickest parts of the limbs,—running them up along the whole length of the fore-arm, and often, at the same time, passing them through the wrist joint,—loading them withal with acrid medicines ;—no wonder, then, that profuse suppurations and dreadful swellings came on ;—but still they continued these cruelties, till the wound healed almost in spite of the pain, or till the coming on of very dreadful pain, great suppurations, and sometimes of convulsions, forced them to desist from this piece of surgery, and to draw out their setons, or sometimes to cut off the limb.

The French especially, artificial in their practice, have been addicted to this use of setons ; and have, from step to step, become so familiar with them, that they have not confined the use of them merely to flesh wounds, but have passed them, as I lately explained to you, quite across the thorax,—across the belly,—and through the great joints, as the knee ;—and, in wounds of the head, have supplied their place with long and slender tents.

When we want to fill up the sac of a hydrocele, or indeed to fill up the sac of any other tumor, what do we contrive, but either to lay it open with a large incision, or to run a seton through it ?—to fill it with some acrid injection, or to cram it with a large tent ? While the animal machine continues the same, the same stimuli will produce the same effects, and a seton injection, or



long tent, if they produce pain and inflammation in the scrotum, will not be easy in the chest; and unless we can use them in the chest, with the same intentions for which we use them in the hydrocele, unless it were our design to inflame the chest, and to cause an adhesion of all the parts, we cannot use them with any consistency or good sense.

This simple reasoning against setons, is so conclusive, as to be a perfect refutation of the arguments used in their support; and, as for the matter of fact and experience, I have lately, in criticising the case given by Mr. Guerin, given you a pretty specimen of their practice, such as will set your conscience quite at ease, although you should be careless enough to omit the seton:—and I have selected this case, not because it was the most foolish of many foolish doings of this kind;—there are many pieces of surgery recorded as wonderful as this;—but because it stands very prominent among the College Memoirs, and is made an authority on this point.

To say that such patients recovered by their setons, is, in my opinion, no more than to say, they recovered in spite of their setons. It is like what happened to a surgeon, who was dabbling in the thorax with a piece of caustic, which fell directly into the cavity of the chest, where it caused very large suppurations, and yet the patient was saved.—The patient recovered in spite of the caustic, just as Mr. Guerin's patient, and many other poor unhappy souls, have lived in spite of the setons. One would think, that people took a pleasure in passing setons across the eyeball, the chest, the knee-joint, &c. merely to make fools stare, when the business might be as effectually done with an abscess lancet\*.

While I am thus reprobating the use of setons, surely that of the tents should not escape. I know of no occasion in all surgery, in which tents can be useful, except in the single one of a narrow opening, which we desire to dilate, in order to get at the bot-

\* If any one should wish to see the opinions of moderate authors, let him turn up the fifth volume of the *System of Surgery*, written by Mr. Benjamin Bell, where "Tents are EMPLOYED, prepared of dried sponge, gentian root, and other ARTICLES; which, by swelling with the moisture of the sores," &c. &c.

tom of the wound ; and where either, on account of some great artery, or the fearful temper of our patient, we dare not use the knife ; there a sponge-tent will force open the wound. A tent for keeping an old ulcer open, is a downright absurdity, since such an ulcer will not close ; but, to fill a fresh wound with hard round tents, is just as bad surgery, and as unnatural, as the passing of a seton across the wound.

The tents also of the French surgeons were often as carelessly managed, as they were imprudently used : —Very frequently, tents used in wounds of the belly were lost, occasioned dangerous suppurations, and were in the end discharged with great pain and danger, at the distance of many months, or even years ; and not unfrequently, tents, drawn in by the backsticking of the lungs, have got into the thorax, lain there unsuspected, have occasioned long suppurations, and even death\*. Nay, still more, tents, which had been used in dressing wounds of the thorax, have made their way into the substance of the lungs, and so been coughed up. Hildanus tells of a man †, who, having been wounded in the breast with a sword, had been long dressed with tents, had escaped from hæmorrhages, difficult breathing, and the other dangers, and his wound at last healed up ; but still he continued spitting pus, till one day, three months after the wounds had closed, he coughed up two tents, which had been used without threads to them.

And Tulpius‡ tells of a Danish nobleman wounded in the German wars, who, after six months of pain and danger, coughed up two tents, with which a wound in his chest had been carelessly dressed ;—and Pigrai, a pupil of Paræus, tells of a soldier who, three or four months after his apparent cure from a wound of the breast, spit up a large piece of his rib, of considerable thickness, and, if my notes are correct, of no less than three inches long.

But if there was also knavery in this way of using tents, that suspicion ruins at once all authority of the older surgeons ; and

\* Vid. Ravaton, p. 221. † Observatio xiv. ‡ Observ. xv.

La Motte declares roundly, that there was almost as much of knavery as ignorance in this practice : “ For I have observed (says La Motte), one of your old master surgeons, in place of curing a wound of the belly in a few days, perform long incisions, cram those incisions with tents, and confine his patients for six months, making a pretty hundred crowns, and much reputation to himself, out of a very simple matter :” so that ignorance and folly begot this practice ; and when it was grown up to strength, knavery leagued with folly, and profited as occasion served.

One thing more I must say concerning this old piece of surgery, that they were not nice about the materials of which their setons or tents were made : for a seton they used in general a piece of good stout tape or garter ; they often took a long strip of linen, and named it a syndon ; and as for their tents, they made them out of any thing that was large enough, strong enough, and hard enough ; and La Motte, who had been often witness to these operations, avers, that they would very willingly have taken the help of a hammer to fasten them in, if they could but have done such a thing secretly or without shame ; and here also they were quite delighted with seeing prodigious quantities of matter spouting out when they drew their spigot away.

Having settled this point, and confirmed you, I hope, in your abhorrence of any thing in practice so harsh and unlike the simple ways of nature, I will return to my subject of wounds of the breast ; for as yet I have described merely the wounds of the lungs. I must also show you what are to be the consequences of wounds in the heart, or in the diaphragm, or on the outside of the chest.

Wounds in the left side of the breast are more dangerous than wounds in the right, on account of the heart's being there ; and a wound through the left side of the breast, followed by faintings, difficult breathing, coldness of the extremities, suppression of the pulse, with great anxieties and deadly fear, are very certain signs that the man is wounded in the heart, and is about to die ; and there is sufficient time for these signs to appear, for it is not always at the moment that the patient dies. One man being

wounded with a sword, the point of it cut the coronary artery, which threw out its blood so slowly that it was two hours before the pericardium was filled with blood ; and then, after great anxiety, the patient died. In another soldier, the apex of the heart was cut with the point of a very long and slender sword ; and this soldier lived twelve hours, during which time, as appeared after his death, the heart had, at every stroke, been losing a small quantity of blood, till it had, in twelve hours, entirely filled the chest, and then the patient was suffocated and died.

But indeed, there is so little to be done in such a case, and the signs and the consequences of such a wound are so clear, that it were a waste of time to speak longer of wounds of the heart. Wounds of the diaphragm are also out of reach, and all that you can desire is, to know what sort of accidents have happened to the diaphragm ; and whether, after a wound of that important muscle, the patient will live or die. Though wounds of the diaphragm are not material in themselves, yet the diaphragm can hardly be touched, but in mortal wounds, *i. e.* in wounds touching both cavities, *viz.* of the thorax and of the abdomen, where most frequently the stomach, lungs, pericardium, or heart, are either wounded or are soon inflamed, and so drawn into disease. But there are some very curious cases, where the patient recovered from the present wound, and died not till some months or years after, by what I may call a thoracic hernia, the bowels passing upwards through the diaphragm into the breast.

Parcé describes his dissection of a mason's boy, who, being wounded in the breast, died on the third day ; and upon opening the body, at first sight, he thought he observed a phenomenon which he could not easily believe ; he thought the stomach wanting ; he went onwards searching with particular care, until at last he found the stomach, not in the belly, but in the thorax, inflated with air ; and he found that it had passed upwards, by the wound in the centre of the diaphragm, through a hole no bigger than to admit the thumb.

But there follows, in Paræus, a much more singular case, and a very interesting one : a M. d'Allon, in the suit of the M. de Bi-

ron, grand master of the artillery of France, was wounded before the city of Rochelle, by a ball, which, entering at the lower end of the sternum, passed out again betwixt the fifth and sixth ribs. This wound was, you perceive, of the most dangerous nature ; for it passed close over the stomach, which, had it been full, could not have escaped. The ball could not fail to wound the diaphragm, —it must also have passed through the lungs, and yet he was cured of his wound, but with an infirmity remaining, which could not be accounted for, till after his death, which happened in about nine months. He was to all appearance cured of his wound, and apparently out of all danger from any consequence of it ; but ever after it, he had a weakness of the stomach, with frequent colics, and never durst make a hearty meal for fear of an attack. In the eighth month after his wound, he had a dreadful attack of this habitual colic, of which, notwithstanding every exertion, he died ; and when his body was opened by the celebrated Guill-meau, there was found in the cavity of the thorax, a great turn of the intestine colon, much distended with wind in the proper condition of a hernia, and much strangulated, you may suppose, since it occasioned the patient's death. Indeed, the hole in the diaphragm was so small that it scarcely permitted the point of the little finger to pass.

Wounds of the sternum should not be passed over in absolute silence, since these also may come under your care. I have formerly taught you, that when wounds and fractures of the sternum cause inflammation, and are followed by a collection of pus, there is formed a cavity under the sternum, which did not naturally exist ; and however much the operation of trepanning, in this case, may be questioned in theory, the fact is, that you are sometimes forced to trepan ; and for this there needs no better authority than that which we have from Galen, in his seventh book (of Dissections).

A servant of Marilus who had received a blow upon the breast-bone neglected it at first ; but there appeared in four months after, a collection of matter upon the sternum, which his surgeon for the time opened and healed ; but it soon inflamed, again pro-



seeded to abscess, was again opened,—but it not healing, a great consultation was called (and Galen, among others): the breast-bone was entirely rotten, the beating of the heart was seen on the left side of the diseased sternum, which frightened the physicians from undertaking his cure; but Galen was contented to take this upon himself: he adventured to cut the whole of the corrupted breast-bone away; the bone adhering to the point of the heart-case or pericardium, that also was of course cut, and the heart exposed quite bare. They despaired of curing such a wound, and yet the patient was in the end perfectly restored. Here, then, we have upon that authority, which has been always respected, a case exceeding, in the miraculous, all that has ever been recorded by the patient Vander Wiel, or gathered by Shenkius, or any German commentator among them. A man with a slow suppuration, confined matter, a carious sternum, and the heart absolutely exposed and bare.

The sternum may be thus fairly undermined with matter, so that where there is truly no natural cavity, a very deep one may be formed; of which we have a curious example recorded by La Motte, of a soldier, who, being wounded at the middle of the sternum with the point of a sword, felt no pain nor difficulty of breathing for some time, as if it had not reached the cavity of the chest. La Motte bled the man, and dressed his wound very simply; but at last the inflammation and oppression did come on; and one day in lifting the dressing, a large glassfull of good pus spouted out, and then probing, he found that his probe went down very deep into the breast; but the matter came gradually in less and less quantities, till at last it ceased, and the wound closed.

You perceive that I have carefully gone through all the possible wounds of the breast; for I have given you lessons upon wounds of the lungs, wounds of the heart, wounds of the diaphragm, and wounds of the sternum; but there is one thing I am much concerned in observing to you, for it will regulate the prognostic that you are to make, and will also be a rule of some importance to you in the cure itself: it is that, in the first place,

you are never to pronounce any wound mortal unless it be plainly a wound of the heart ; for the recoveries which men make after the most desperate wounds of the lungs, are truly surprising ; and, next, you must be careful to distinguish wounds of the pectoral muscle, shoulder, or scapula, from wounds of the breast ; for, were you not warned of this singularity, you would be inclined to believe that a wound had passed directly across the breast, when in fact the ball, or weapon, had only turned round the breast and done no harm.

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I shall now, in conclusion of this subject, reduce all that is important into the form of aphorisms or rules, showing the several degrees of danger, and the several ways of giving relief. And there is no subject on which I more willingly bestow this degree of labour ; for this business of wounds of the breast is important ; and it might, if I should leave it without saying more, appear somewhat confused.

1st, If the patient lie oppressed, tossing, insensible,—his face ghastly, and his extremities cold,—his condition is very doubtful ; it looks much like a wound of some vessel, near the root of the lungs ; and if so, he is surely gone.

2dly, If the oppression come on more slowly, the pulse only hurried and fluttering, and the extremities not so cold, there is reason to hope, that his wound is merely in the edges of the lungs ; and, as it is at a distance from the great veins and arteries, he may escape.

3dly, If spitting of blood, and the emphysema, or windy tumor come on, unquestionably he is wounded in the lungs ; but that wound is not always fatal :—If either the blood do not flow in upon the lungs in great quantity, or if, by our profuse bleedings, that bloody exudation into the lungs can be restrained, then he may be saved.

4thly, If, when there is much oppression, we put our finger into the wound, let some blood out, and so give relief, we are sure

that the suffocation proceeds from blood extravasated in the thorax ; and that kind of suffocation we know to be less dangerous by far than that proceeding from blood poured into the proper cavity or cells of the lungs, *i. e.* into the air-cells, into which we draw the breath, and which, while they should be filled with air, are choked with blood.

5thly, If a bullet pass fairly through and through, the patient is safer : he is in great danger, if it stop, whether within the thorax, or in the lungs ; for when it passes through, as soon as we have saved him, by bleedings, from the first dangers, he is saved : But while it remains within the chest, he is exposed to tedious suppurations, incurable sores, hectic, wasting, and death ; and nothing so wearies the surgeon, or depresses the patient's hopes, as an unceasing flow of matter, and a fistulous sore ; nor can any thing be more distressing to the surgeon than the seeing a patient slipping through his hands (to use so vulgar a phrase), more especially if, during a lingering distress, he has thought it necessary to support the friends with hopes and promises ; for then it falls peculiarly hard on all concerned ;—on the surgeon, who has suggested, or allowed such hopes, as well as on those who have permitted themselves to be thus deceived.

I shall next, after what is commonly called the prognosis, explain to you in another set of aphorisms, how you should conduct the cure.

1st, I think you will not easily forget, that sword or bayonet-wounds, often need no dilatations ; and that the secret dressing, as it was called, or sucking the wounds, or in plain terms, the cure by adhesion, had been, in such cases, attended with wonderful success.

2dly, You know that gun-shot wounds require dilatation more frequently, from the peculiar nature of the wound ; and that such incisions must be particularly large, when you are sensible, that there are many splinters of the ribs to be extracted ; that there are pieces of cloth driven in ; or that there is much blood lying upon the diaphragm and lungs.

3dly, You will remember, that the first and great danger is

that of suffocation, from blood poured inwards to the trachea, and into the cells of the lungs ;—that it is your duty to keep the patient low, and to drain his system so thoroughly of blood, that none shall pass towards the lungs to suffocate him ;—and that there may not be blood enough in the system to serve as fuel for that inflammation, which, sooner or later, must come on, the excess of which is thus provided against, without any particular rule.

4thly, The next great danger is of blood within the thorax, oppressing the lungs. It may perhaps be gotten out, by laying the head and shoulders out of the bed, making the patient heave and strain for its discharge ; but these are rather the attempts of less regular or skilful surgeons, while a man of real skill boldly puts his finger into the wound, or introduces a tube, or makes a new wound, if the first be too high in the thorax ; and he makes his wound so free as to have it in his power to tie the intercostal artery easily, if it be from it that this blood has come.

5thly, The emphysema is the symptom the most alarming, and yet the least dangerous of all ; it advances so fast, covers the chest so quickly, blows up, at last, the neck and face, and is, withal, so strange a symptom, that the patient is terrified, but the surgeon cannot be alarmed ;—he knows the symptom, and how trifling it is ;—scarifies the wound, presses out the air, and makes the passage for the air so free, that it cannot collect again.

6thly, The surgeon, never free from anxiety during the cure, watches the breathing, the cough, the fever, and the condition of the wound ; keeps an eye upon all these points at once ; and when there is a pricking in the side,—when there is any aggravation of the cough,—when there is an increase of the discharge, instantly his fears are excited for his patient's safety ;—he probes the wound, feels it with his finger,—washes the thorax with an injection,—is at infinite pains to find any little piece of bone that may be touching the lungs,—and tries to hook out any piece of cloth with his probe, or to float it towards the wound, by a mild and warm injection.

7thly, Sensible, at every turn, how slight a matter will irritate

the pleura and lungs, he will never allow himself to do so unnatural and cruel a thing, as to pass a great cord across the chest, which is thus easily irritated by the most trifling piece of bone, or rag of cloth ; but merely lays a bit of oiled caddis gently within the wound, with a large emollient poultice over all.

Sthly, And he must learn to play the part of surgeon and physician at once ; and very fit it is, that the man who is managing the wound, should guide the system. Let the surgeon then lay aside all apprehensions, and all theory about fevers, and commotions of the system, to attend to the single duty of managing the patient's strength,—whom he must bleed, in the first instance, almost to death,—bleeding not according to his own prudence, but according to the exigencies of the case. He must repeat his bleedings, whenever bloody expectoration returns ;—whatever lengths that threatens to go, he still must go before it, and prevent suffocation, by draining the system of blood.—He bleeds, then, in the first days, not according to his discretion, but according to the exigencies of the case, against his will, reckoning to pay dearly for the present bleedings in some future period of the cure ; and when the time comes, in which the oppression is forgotten, and the danger of suffocation, and the bleedings from the lungs are over, he begins to support his patient's strength with opium and bark,—and nourishing diet and milk ;—and then the ignorant friends begin to blame him for those very bleedings which really saved the patient's life ; then only he feels within himself the value of all his former care of his patient ; “ he is so strong built up in honesty, that peevish words pass by him as the idle wind, which he regards not.”



## DISCOURSE III.

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### ON WOUNDS OF THE BELLY.

EVERY wound is a disease, and every disease varies according to the constitution of the parts affected, and according to the offices which the parts are destined to fulfil. In the abdomen, the principles which explain its diseases, are extremely simple and plain : we find the chief cause of danger to be the tendency of the peritoneum to inflame ; we find every wound apt to excite this inflammation, and every inflammation, however slight, apt to spread, to extend itself over all the viscera, and terminate in gangrene and death. Upon these grounds, we cannot but pronounce a wound of the belly to be a mortal wound.

There are a thousand occasions on which this delicacy of the peritoneum may be observed ; the wound of the small sword, and the stab of the filetto, explain to us how quickly the peritoneum and all its contained bowels inflame by the most minute wound, although it be almost too small to be visible on the outside, and scarcely within ; for often upon dissection no intestines are seen to be wounded, and no fæces have escaped into the abdomen. In those who die after lithotomy, we find the cavity of the peritoneum universally inflamed ;—the operation of Cæsarian section is fatal, not from any loss of blood, for there is little bleeding ; nor from being exposed to the air, for they also die in whom the womb bursts, and where the air is not allowed to enter ; but merely from that inflammation which succeeds to wounds of the peritoneum, small as well as great, of which we have sometimes a melancholy proof in the operation of hernia, in which the stitching the wound according to the whimsical improvements of some modern surgeons, or where the mere tying

of the sac, as in the practice of the old rupture-doctors and castrators, often raised such inflammation as spread very quickly over the abdomen, and ended in gangrene.

The first principle, therefore, and the thing most to be spoken of in explaining wounds of the belly, is this tendency of the peritoneum to inflame; and the cause which immediately excites this inflammation must be still more noticed. For though this inflammation may no doubt come on from the slightest scratch in the peritoneum itself; yet, in general, it arises rather from the wound of some one of the viscera: If an intestine be wounded, it pours out its fæces into the abdomen; if the liver, spleen, or kidney be wounded, these pour out blood; if the bladder, then the urine filters into the cavity of the belly. The food, or fæces, or urine, or blood, are as foreign bodies lying in the cavity of the abdomen, which no activity of the absorbents can remove. They remain there as foreign bodies, which soon cause inflammation; there follows a knotting together, and great disorder of all the intestines, attended with intense vomiting, excruciating pains, hickup, a quick, weak, and fluttering pulse, mortification of the bowels, and then a low delirium closes the scene.

Wounds of the head are deadly, from the oppression of the brain; and there delirium or coma are the deadly signs. Wounds of the breast are fatal, by the oppression of the lungs; and there difficult breathing, tossing, coughing of blood, coldness of the extremities, and a faltering pulse, are the mortal signs. Wounds of the abdomen are mortal, by the inflammation and gangrene; and the signs of danger are, swelling of the abdomen, intense pain, vomitings, costiveness, hickup, faintings, then an interval of deceitful ease, which is merely a sign of internal gangrene, and of the near approach of death.

Thus you perceive that a lecture on wounds of the abdomen must be a lecture on inflammation of that cavity, and of the various ways in which it is produced. It is also but too plain, that here we are spectators merely, or with kinder thought of watching over our patients, and doing the little that art can do; but that in general we have no other privilege than that of pronoun-

cing whether he is likely to live or die. This also must be remarked, that while laying down the general principles, we would be ready to pronounce every wound of the abdomen must be mortal ; but when we descend to the particular cases, we have such strange examples of unexpected cures, that we are ready to retract our first position, believing that hardly any wound is deadly ; and the reason of this deception must also be observed. Having put it down as a prognostic, which is but too well confirmed, by much melancholy experience, that wounds of the belly are mortal, there is no reason why we should, in recording our cases, take any note of a man having died after such a wound ; death, from such a wound is a daily and expected occurrence, and therefore it is not marked ; but, if we find that a man has escaped, are we not to record every such escape ? Is it not our duty to set up and marshal in fair array all the possible wounds, to mark out which are possibly safe, and which are absolutely mortal ; to distinguish the various accidents of all the various wounds ; and to try whether by such observations we can lessen their dangers ? Thence it comes to pass, that, in one short sentence, we announce the general principles of such wounds,—in one short and general prognostic we declare them to be fatal ; we thus bestow but a few moments on their general character, while we spend hours in marking their lesser varieties, and in recording all the accidents and chance cures, collecting evidence about hair-breadth escapes, till we almost lose sight of the general principle which proves such wounds to be mortal. This confusion must be peculiarly felt by a diligent student, who, the more he reads, the more he wanders, finds anuses at the groin, and miraculous recoveries in every book, and reads of cures, till he forgets that there are dangers.

In judging of wounds of the lower belly, much must be taken into account before we form our opinion. We are often likely to be deceived ; we see the patient lying quiet and easy, while we know that he is on the very brink of danger ; and there is often great confusion and alarm when the patient is absolutely safe ; for balls sometimes turn so, that a shot shall pass through among all the bowels, without wounding one ; though it must be ac-

knowledge, that the belly is so full of parts essential to life, that there can hardly be a wound of the abdomen in which one or other of the bowels is not concerned.

Our patient feels little in the moment of the wound, save that confusion, trembling, and alarm which is the immediate consequence of fear, but which is allayed by time and a slight opiate, or a cordial draught.

If stools come on soon after the wound, and if the belly continue regular and easy but for a few days, it is a comfortable assurance (or it is almost an assurance) that the bowels are unhurt.

If, on the second, third, or fourth day, a swelling, pain, and burning fever come on, if soon after there come dreadful torments, then the belly is completely inflamed, and the danger very great; the bowels will mortify, and the patient being suddenly relieved from pain, will be easy for a few hours, and will sink, after this deceitful interval, into a low and muttering delirium, and die.

If this threatening inflammation be kept off by profuse bleeding, by low diet, and by absolute rest; or if it be thus subdued after having begun, then the chief danger is over, and the patient is in some degree safe. Yet sometimes the belly is easy, and the bowels regular for some days, when most unexpectedly fæces appear at the outward wound; which accident throws us back into great consternation; it is a sign of great danger; for often, though the bowels are wounded, yet from their emptiness, or the closeness of the wound, or from vomiting, or by some other chance, the fæces are not at first discharged through the wound. And again, though the belly continuing regular and easy for many days is no doubt a proof that the intestines are not wounded, it is by no means a perfect security that they are not hurt; for the ball may have brushed through among them with such velocity that the intestines may be bruised like the external wounds, the hurt parts of the intestines may slough off, and the intestines opening from such a cause, on the sixth, eighth, or tenth, or fifteenth day, will pour out their fæces into the cavity of the abdomen. The signs of these two kinds of injury to the in-

testines are very plain ; for, if there be a direct wound of the bowels, there will be an immediate interruption of stools, immediate swelling of the belly, vomiting, hickup, and death : or, on the other hand, there may come, after many days of free passage in the belly, a sudden interruption of the stools, with as sudden a swelling and hardness of the belly, then vomiting, hickup, and death ; and then we find, upon dissection, that this sudden death has been from a gangrene of the bowels, which had been bruised in the rapid passage of the ball, the eschar of that gangrene not breaking till the eighth or tenth day.

Since, then, this slough of the bruised intestines will fall out about the time of the inflaming of the wounds, we never can be without great anxieties about our patient's safety, till after the sloughing of the wounds is over : and even then our patient is only in some degree, but not entirely, safe ; for there is another danger still :

The two wounds, viz. the entrance and the exit of the ball, being gun-shot wounds, continue dead and callous for five or six days ; then the bruised parts recover their action,—inflame, swell, and throw off their putrid sloughs. It is but too plain, that this inflammation of the external wound may be communicated to the whole cavity of the abdomen, and the inflammation of the abdomen may be thus renewed. This, also, is to be guarded against ; and therefore we do not relent in bleedings, low diet, perfect and absolute rest, till the fifteenth or twentieth day.

If, unhappily, the ball has not passed through, but remains somewhere within the abdomen, other fears and dangers await us, which bring to our remembrance, the aphorism concerning wounds of the thorax, that “ while the ball remains within the thorax, the patient, though saved from the first dangers, is exposed to tedious suppurations, incurable sores, hectic, wasting, and death ;—and nothing so wearies the surgeon, nor depresses the patient's hopes, as an unceasing flow of matter, and a fistulous sore.”

Here, also, the patient is peculiarly exposed to wasting suppurations, and to still greater dangers. The ball, if it have entered near the navel, or upon the middle line of the belly, will stick in



the lumbar vertebræ, and will cause paralysis of the bladder and lower extremities, soon followed by death. If it have passed obliquely through the abdomen, or to one side of the middle line, it will lodge in the thick flesh of the Iliac, or Psoas muscle; and the patient, after having passed through the first dangers, feels little more than a weight and weariness of the loins; but when he raises himself to sit up in the bed, the weariness is converted into pain. Sometimes the ball makes a bed for itself, and lies harmless in the loins;—sometimes also, if the shot has entered near the pubis, by passing over the thigh, and has gone obliquely upwards, there is a frequent draining of matter, and a small fistulous sore; but most frequently of all, the outward wound closes, the patient is never relieved from a dull and heavy pain, never recovers the free use of his limbs, nor is able to support his body erect, but wastes under a slow hectic fever; and when he dies, there is found a great abscess in the loins.

Sometimes a ball, passing obliquely, not from below but upwards, from above downwards, enters the belly, breaks some of the bones of the pelvis, passes out perhaps through the middle of the haunch bone;—and there a very free dilatation is required, both to make an open wound, and to take away the splinters of so large a bone, and to prevent matter forming within the pelvis, and inflaming the abdomen.

Sometimes a ball, entering over the thigh, and near Poupart's Ligament, or about the ring, seems to pass into the abdomen, while, in fact, it goes behind the peritoneum, courses along the bones, lodges about the Ala Ilii, or perhaps goes so high as the loins. There the inflammation is subdued by bleeding, and never reaches the abdominal cavity; or if it threaten to do so, it is easily restrained; a fistulous sore ensues; at times it gleans profusely; then it stops, with swelling and pain, not without danger; again it bursts out, and runs freely, and pieces of cloth, and fractured or spoiled bones are from time to time discharged; the finger, or probe, are sometimes introduced in search of the ball; sometimes we feel an indistinct rub, as in sounding for the stone; when it disappears; then we feel it again; and again it disappears;

till at last, in a lucky hour, the ball presents itself at the groin, and is pulled away. In all this there is an appearance, of the ball's changing place, so strong, as to encourage us to try at last what posture will do; for turning often upon the belly has actually brought such balls towards the groin; which need not surprise us, when we see balls not lodged, as in this case, among a looser cellular substance, but, in the solid flesh of the limbs, work downwards by posture, and their own weight.

Often, when balls go down into the pelvis, they are fatal by the wound being in the bladder, and the urine getting into the abdomen; or by causing a high and gangrenous inflammation; or by the thickness of the bones that are broken, producing long suppuration, and an incurable sore: But sometimes the first inflammation being subdued, such balls lodge about the bones; and we can neither conceive where they can be so effectually concealed, nor how they can lie there without danger or pain.— Sometimes, however, the ball lies looser, falls down into the bottom of the pelvis, and produces tumor there; and once Mr. Bordenave, after such a wound, feeling a fluctuation in the perineum, made a lithotomy-like incision, and got out some pieces of shirt, much urine, much clotted blood, and the ball, so that his patient was perfectly cured.

Having spoken of this inflammation of the peritoneum, as the chief cause of danger, let me next explain to you, how this same inflammation is also (by causing an adhesion of the wounded bowel) the only means of safety; for if a wounded or diseased bowel were to continue but a few hours unattached to the abdomen, it must be fatal. If the liver be inflamed, it adheres to the peritoneum; their substances are so mixed, that they become as one, and then the pus, gathered within the substance of the liver, instead of being poured out into the abdomen, makes its way outwards, and so the abscess bursts, or is punctured, and heals. In dropsy of the ovarium, we should not dare to tap the patient, lest the intestines should be betwixt the integuments and this dropical sac, but that we know, how the sac of the diseased ovarium unites itself, by inflammation, to the inner surface of the perito-

neum, as soon as they touch each other. If a fœtus be conceived in the ovarium, or be by laceration thrown out of the womb, the woman, if she survive, is freed from her burden by the sac which encloses the child adhering to the inner surface of the abdomen, where abscess forms, and the fœtus is expelled piecemeal, bone after bone, till the whole is discharged. In hernia, an adhesion of this kind saves the life ; for the intestine, which is hurt in the stricture of a hernia, is strangulated, inflames, mortifies and bursts ; and then it would go back into the belly, cast out its putrid fæces there, and so prove fatal, but that the gut always inflames before it mortifies ; during that state of inflammation, it is hard driven into the ring ; there it is fixed, adheres, is straitened more and more, till the mortification is complete. But observe how this is effected ; all that is below the stricture mortifies ; all that is above it is sound ; all that is in the very strait of the ring is highly inflamed, and has so adhered, that before the lower part mortifies, this part is firmly fixed in its place ; and when the mortified part bursts out, the inflamed part keeps its place in the groin, adhering to the ring. It is thus that the preternatural anus is formed, and the surgeon, in sewing such an intestine to the ring, takes useless pains to fix what has already adhered ; if there be a work of supererogation in surgery, as I believe there are but too many, surely this of sewing an intestine is one.

This it is which makes the chief difference, in point of danger, betwixt an ulcerated and a wounded intestine ; for, in a wound, there is, as we should suppose, no time for adhesion, nothing to keep the parts in contact, no cause by which the adhesion might be produced : But, in an ulcer, there is a slow disease, tedious inflammation, adhesion first, and abscess and bursting afterwards ; sometimes a fistula remains, discharging fæces, and sometimes there is a perfect cure. If a nut-shell, a large coin, a bone, or any dangerous thing be swallowed, it stops in the stomach, causing swelling, and dreadful pain ; at last, a hard, firm tumor appears, and then it suppurates, bursts, the bowel opens, the food is discharged at every meal, till the fistula gradually lessens, and

heals at last :—But where the stomach is cut with a broad wound of a sabre, the blood from the wounded epiploic vessels, or the food itself too often pours out into the abdomen, and the patient dies. In the same way, if the piece of bone, or the coin go down into the intestines, and stick in some narrower turn, causing an inflammation there, or if worms, nestling in the bowels, hurt them, the inflammation of the hurt intestine unites it to the peritoneum, abscess forms and bursts, the worms, or coin, or piece of bone, are discharged, the fistula heals, and all is safe : But if the same piece of intestine were wounded with a ball, much more if with a clean cut of a sabre, how could it fail to pour its fæces into the abdomen, or what could keep the wound of intestines opposite to the external wound, or cause them to adhere ? Why, there is one cause but little noticed, perhaps, and yet of considerable effect, which, though it cannot always prevent the discharge of fæces into the abdomen, often does.

I am well persuaded that the intestines move less, in respect to their appropriated point of the abdomen, than their croakings in flatus, or their motion in our experiments upon opening animals, should lead us to suppose \*. We see the bowels loose and floating, when we open a body ! we see them hanging by the mesentery, and we call it a ligament for supporting the bowels ! and we see bowels turning over each other, in the cruel experiments which we make upon living creatures †. These circumstances make an

\* When I speak of their motions, in our experiments upon animals, I mean to allow, for the sake of argument, more than can easily be proved :—For I must mention to you, after all that has been said about peristaltic, vermicular, and antiperistaltic motions, that you may cut open twenty live cats, and never have the luck to see the least degree of motion in their intestines, nor any such thing. Vid. *Memoires de l'Academie des Sciences*.

† It is only, after having given the creatures the most acrid poison, that we can see violent contortions of the bowels ; we seldom see any thing like this in the natural condition of the bowels. —We see nothing like it, when the bowels of a human subject are among our hands, as in wounds or in hernia. —We feel nothing like it, when, after rupture of the womb, we follow the child into the abdomen, with our hand, to extract it. —I have seen a child born, wanting all the integuments of the abdomen, the perito-

Impression which it is not easy to forget ; and yet, when we talk of blood, or of fæces falling into the cavity of the abdomen, as if there were there some empty space, such as we see upon opening a dead body, I fear that we have a very poor notion of the abdomen, very unlike the truth.

There is not, truly, any cavity in the human body, but all the hollow bowels are filled with their contents,—all the cavities filled with their hollow bowels, and the whole is equally and fairly pressed. Thus, in the abdomen, all the viscera are moved by the diaphragm and the abdominal muscles, upwards and downwards, with an equable continual pressure, which has no interval ; and one would be apt to add, the intestines have no repose, being kept thus in continual motion ; but though the action of the diaphragm, and the re-action of the abdominal muscles, is alternate, the pressure is continual ; the motion which it produces, is like that which the bowels have, when we move forwards in walking, having a motion with respect to space, but none with regard to each other, or to the part of the belly, which covers them ;—the whole mass of the bowels is alternately pressed, to use a coarse illustration, as if betwixt two broad hands, which keep each turn of intestine in its right place, while the whole mass is regularly moved :—When the bowels are forced down by the diaphragm, the abdominal muscles recede ; when the bowels are pushed back again, it is the re-action of the abdominal muscles, that forces them back and

neum only covering the bowels, and as transparent as a piece of the finest oiled paper ;—and there I saw no motion, though I often looked with anxious attention, both while the child was asleep, and when it was struggling, being awake ; and I have kept the preparation, to authenticate as much of the fact, as a preparation can explain.—I have looked, with the same degree of attention, to the bowels of a man, who, having thrown himself from a great height, had burst the abdomen entirely, so that all the bowels hung out.—I have, indeed, not been guilty of cutting open the bellies of many cats or pigs, but I have a very poor opinion of the proofs which will arise from such experiments, from all that I have hitherto seen.—That there is a motion in the intestines, it were very bold and ignorant to deny ; but that there is that kind and degree of motion, which has commonly been described, I am very far from believing.



follows them ; there is never an instant of interruption of this pressure, never a moment in which the bowels do not press against the peritoneum ; nor is there the smallest reason to doubt, that the same points in each are continually opposed. We see that the intestines do not move, or, at least, do not need to move, in performing their functions ; for, in hernia, where large turns of intestines are cut off by gangrene, the remaining part of the same intestine is closely fixed to the groin, and yet the bowels are easy, and their functions regular. We find the bowels regular, when they lie out of the belly in hernia, as when a certain turn of the intestines lies in the scrotum or thigh, or in a hernia of the navel ; and where yet they are so absolutely fixed, that the piece of intestine is marked by the straitness of the rings. We find a person, after a wound of the intestine, having free stools for many days ; and what is it that prevents the fæces from escaping, but merely this regular and universal pressure ? We find a person, on the fourth or fifth day, with fæces coming from the wound ! a proof, surely, that the wound of the intestine is still opposite, or nearly opposite to the external wound. We find the same patient recovering without one ill sign ! What better proof than this could we desire, that none of the fæces have exuded into the abdomen ?

If, in a wound of the stomach, the food could get easily out by that wound, the stomach would unload itself that way,—there would be no vomiting, the patient must die ; but so regular and continual is this pressure, that the instant a man is wounded in the stomach he vomits, he continues vomiting for many days, while not one particle escapes into the cavity of the abdomen : The outward wound is commonly opposite to that of the stomach, and by that passage some part of the food comes out ; but when any accident removes the inward wound of the stomach from the outward wound, the abdominal muscles press upon the stomach, and follow it so closely, that if there be not a mere laceration extremely wide, this pressure closes the hole, keeps the food in, enables the patient to vomit, and not a particle, even of jellies or soup, is ever lost, or goes out into the cavity of the belly.

How, without this universal and continual pressure, could the viscera be supported? Could its ligaments, as we call them, support the weight of the liver—or what could support the weight of the stomach when filled? Could the mesentery or omentum support the intestines—or, could its own ligaments, as we still name them, support the womb? How, without this uniform pressure, could these viscera fail to give way and burst? How could the circulation of the abdomen go on? How could the liver or spleen, so turgid as they are with blood, fail to burst? Or what possibly could support the loose veins and arteries of the abdomen, since many of them, *e. g.* the splenic vein, is two foot in length, is of the diameter of the thumb, and has no other than the common pellucid and delicate coats of the veins? How could the viscera of the abdomen bear shocks and falls if not supported by the universal pressure of surrounding parts? In short, the accident of hernia being forced out by any blow upon the belly, or by any sudden strain, explains to us how perfectly full the abdomen is, and how ill it is able to bear any pressure, even from its own muscles, without some point yielding, and some one of its bowels being thrown out. And the sickness and faintness, which immediately follow the drawing off of the waters of a dropsy, explain to us what are the consequences of such pressure being, even for a moment, relaxed.

But, perhaps, one of the strongest proofs is this, that the principle must be acknowledged, in order to explain what happens daily in wounds; for though in theory we should be inclined to make this distinction, that the hernia or abscess of the intestines will adhere and be safe, but that wounded intestines not having time to adhere, will become flaccid, as we see them do in dissections, and so, falling away from the external wound, will pour out their feces into the abdomen, and prove fatal; though we should settle this as a fair and good distinction in theory, we find that it will never answer in practice. Soldiers recover daily from the most desperate wounds; and the most likely reasons that we can assign for it are, the fulness of the abdomen, the universal, equable, and gentle pressure; and the active disposition of the pe-

ritoneum, ready to inflame with the slightest touch ; the wounded intestine is, by the universal pressure, kept close to the external wound, and the peritoneum and the intestine are equally inclined to adhere ; in a few hours that adhesion is begun which is to save the patient's life, and the lips of the wounded intestine are glued to the lips of the external wound. Thus is the side of the intestine united to the inner surface of the abdomen ; and though the gut casts out its fæces while the wound is open, though it often casts them out more freely while the first inflammation lasts ; yet the fæces resume their regular course whenever the wound is disposed to close ; or if the fæces should not resume their natural course, we may force them onwards, by closing the wound with a plaster, thus healing the fistula, which otherwise might never close.

The two chief points of this doctrine are curiously proved by a case delivered by Mr. Littre, anno 1705, it is the case of a madman who stabbed himself with eighteen deep wounds, in the belly, and of these eighteen wounds, made with a long and sharp pointed knife, eight penetrated into the cavity of the abdomen. The fever, pain, swelling, and difficult breathing, with vomiting and purging, proved them to be dangerous wounds ; vomiting of blood, and clots of blood discharged by stool, proved that the wounds touched the stomach and intestines ; yet, desperate as this case appeared, in two months the man was entirely restored. But here lies the important point ; his madness came upon him again, and about eighteen months after, he threw himself from a high window, and died upon the spot : Upon opening his body, it was found, first, that the liver had been wounded, and had adhered in its middle lobe to the inner surface of the peritoneum ; secondly, the jejunum had been wounded, just below the stomach, with a cut half an inch in length, across the gut, and this intestine lying deep, was not pressed against the internal surface of the belly, but was kept in close contact with a contiguous turn of the same gut. The two turns of intestine adhered to each other ; on the one intestine was the scar of the wound, while the other turn of intestine to which it had adhered was sound. Thirdly,

The right side of the colon had been wounded with a cut of an inch in length ; the scar which it left was half an inch long ; the adhesion here was to the inner surface of the peritoneum, by eighteen or twenty long thread-like tags of cellular membrane, or of peritoneum, issuing from the inner surface of one of the greatest scars in the belly.

Surely these things prove that the universal pressure within the abdomen is so uniform and constant, that not one only, but all the viscera of the abdomen may be deeply wounded, and yet no blood nor fæces be allowed to escape. They prove that this universal pressure keeps all the parts so in contact that they have the fairest opportunity of adhering. The particular manner in which the wounded turn of the duodenum had adhered to the opposite sound turn of the same gut; proves, that, towards which side soever a wounded intestine is pressed, it there finds the parts disposed by a sort of contagion, to inflame, and to adhere. And one thing appears to me very curious in this process of nature, that as soon as wounded parts adhere, then all the dangers of spreading inflammation cease ; so that it is not by the stopping of the inflammation at the true point, that the wounded part adheres ; but it is rather by the adhering of the wounded part that the inflammation is prevented from spreading wide over all the surfaces within the abdomen, just as the obliterating of an inflamed vein, by putting its sides together with a compress, stops the progress of the inflammation along that vein.

In short, if any man had made experiments like these, upon animals, with the hopes of proving such a doctrine as that which I have proposed, he would have been very vain of his success.

Our good old surgeon Wiseman has said with great simplicity, as a great many have said after him, " Thus it frequently happeneth that a sword passeth through the body without wounding any considerable part : " he means, that a rapier or ball often passes quite across the belly, in at the navel, and out at the back, and that (without one bad sign) the patient recovers, and (as has very often happened) walks abroad in good health, in eight days ; which speedy cure has been supposed to imply a simple wound,

in which all the bowels have escaped : But we see now *how* this is to be explained ; for we know that, in a thrust across the abdomen, six turns of intestine may be wounded,—each wound may adhere ; adhesion, we know, is begun in a few hours, and is perfected in a few days ; and when it is perfect, all danger of inflammation is over ; and when the danger of inflammation is over, the patient may walk abroad ; so that we may do just as old Wiseman did in this case here alluded to \*, “ Bleed him, and advise him to keep his bed and be quiet.” In short, a man thus wounded, if he be kept low, has his chance of escaping by an adhesion of the internal wounds.

Thus you see I have made good that axiom which I laid down at the head of this discussion, too long perhaps, but which I could not avoid, viz. “ That this tendency of the peritoneum to inflame, which is the chief cause of danger, is also the only means of safety.” And having laid down the principles upon which you are to calculate the dangers of each wound, it will be easy for you to understand the distinction of wounds ; you will naturally apprehend, that this (like many other provisions of nature) too often fails ; and that there will be danger of fæces getting out into the abdomen, just in proportion to the broadness of the wound, or according to the bowel that is struck. If the stomach be wounded, there is reason to fear lest that bag, which lies so deep, and sinks so much under the weight of the liver, when emptied of its contents, should fall away from the outward wound. If a small intestine be wounded, there is more reason to hope, that the general pressure will keep it in close contact with the walls of the abdomen, so as to give it an adhesion to the wound. If the great gut be wounded, near either of the groins, our chance is mended still more, for the caput coli, and its sigmoid flexure, are so fixed down to the loins, as to secure us against many accidents.—The wound of that gut will not forsake the wound of the abdomen ; the fæces will surely escape into the cavity of the belly ; the intestine will not be so likely to double upon itself, and

\* Page 98. The case of a man who was wounded across the belly, and well, and abroad in seven days.



protrude, like a prolapsus ani, an accident which the floating intestines are peculiarly subject to, when they have been engaged in herniæ, and have gangrened, so as to have formed an anus at the groin. Lastly, By the close connection of the bottom, especially of the caput coli, with the thick and fleshy parts of the loins, it easily heals. All this has been observed a hundred times, when this great gut has been engaged in herniæ, or when worms, cherry stones, bones, leaden bullets, or other dangerous things, have remained in it, so as to cause an abscess with discharge of fæces in the groin, or when the wounds of swords have penetrated into the gut.

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But other conclusions may perhaps arise from the doctrine of universal pressure, which, once settled and acknowledged, would prove fatal to one of the most approved theories of the present day ; for, if there be any one general doctrine in modern surgery universally received, and having a general influence on practice, it is this, that air, being admitted into the cavities of shut sacs, causes an inflammation, which runs round the whole membrane ; disorders all the parts contained in it ; and almost always causes death, whether it be by suddenly hurting the vital parts, as when the inflammation is in the head, breast, or belly ; or, whether it be by hectic, and a slow fever in wounds of the less important parts, as of the burfæ, or joints. And yet if there be any one doctrine, which the common laws of philosophy seem to contradict, it is this ; for how air should (according to the now vulgar phrase) “ get access to the cavity of a shut sac,” it is not easy to conceive. Whatever has become a general opinion must command respect ; and, therefore, while I propose some doubts on this subject, I hope that they will be considered as doubts merely, not as refutations ; for doubts, concerning a general opinion, will arise in a man’s mind, long before a perfect refutation can be accomplished. It seems to me, that there are here chiefly two

points to be settled, 1st, Whether air really can be admitted ~~that~~ into the cavity of the abdomen? 2d, Whether, though air were freely admitted, it be capable of producing those dreadful effects which are ascribed to it.

If there be any truth in the doctrine which I am trying to establish, there can be but very little reason in the common theory of air being admitted among the bowels. Suppose a wound of an inch in length :—suppose the bowels to have sunk, in some strange way, into the pelvis, for example, so as to have left a mere vacuum ; what should happen with the flexible parietes of the abdomen ? Should they stand rigid, while the air rushed into the cavity to fill it ? No surely. But, on the contrary, the walls of the abdomen would fall together, and the pressure of the outward air, far from making the air rush in by the outward wound, would at once lay the belly flat, and close the wound. But since the walls of the abdomen are not flaccid, nor the cavity empty, but the abdomen full, and the flat muscles which cover it acting strongly, the effect must be much more particular ; for, the moment that the belly is wounded, the action of the muscles will force out part of the bowels ; the continuance of that action is necessary to respiration ; the respiration continues as regular after the wound as before ; and the continual pressure of the abdominal muscles and the diaphragm against all the viscera of the abdomen prevents the access of air so effectually, that though you should hold such a wound open with your fingers, no air could pass into the abdomen, farther than to that piece of gut which you first touch with your finger, when you thrust it into the abdomen : Nothing is absolutely exposed to the air, except that piece of intestine which is without the abdomen, or that which you see, when you expose a small piece of the bowels, by holding aside the lips of the wound. The pressing forward of that piece, and the protrusion of a portion of the gut, proportioned always to the size of the wound ; the pressure from behind keeping that piece protruded, so that it is with difficulty that you can push it back with your finger ; this incessant pressure in all directions, is

an absolute security against the access of air. The intestine comes out, not like water out of a bottle, the place of which must be supplied by air entering into the bottle, in proportion as the water comes out ; but the gut is pushed down by the action of the muscular walls of the abdomen, and that action follows the intestine, and keeps it down, and prevents all access to the air, whether the gut continue thus protruding, or whether it be reduced ; for, if it be reduced, the walls of the abdomen yield, allowing it to be thrust back, but admitting no air. Those who want to know the effect of air, diffused within the cavity of the abdomen, must make other experiments than merely cutting open pigs' bellies ;—they must give us a fair case, without this unnecessary wound.—We will not allow them to say, when they cut open the belly of any creature with a long incision, that the inflammation arises from the air :—Much less shall we allow them to say, when they open the belly with a smaller incision, that, by that little incision, the air gets into the abdomen, or that all the bowels are exposed to the air. They must not cut open the bellies of their animals ; they must merely puncture them, and then blow them up.

But this reasoning goes still farther ; for it proves, that air can have no access to the cavity of any abscess, which is contiguous with the abdomen ; for the continual motion of the walls of the abdomen, with the continual motion and pressure of the bowels, will keep the walls of such abscesses in continual contact with each other, except in so far as they are dilated and separated by matter formed within the abscess, or by foul air generated along with that matter. I am sure Mr. Abernethy will pardon my mentioning his book here, since I do it in no unfriendly way : He should have gone a point farther than he has ventured to do ; he might have denied, upon the soundest principles, that the air ever has access to the cavity of a lumbar abscess ; for the air cannot enter such an abscess while it lies, as it does, deep in the cavity of the abdomen, under the weight of all the viscera, and continually pressed by the motion of its muscles ; nothing could fill

a lumbar abscess with air, but actually inflating it from the orifice at the groin \*."

This effect, also, I would number up along with all the other consequences of the continual and universal pressure within the cavity of the abdomen. It is this pressure which gives a continual and gentle motion to the viscera, continual support to them in their several offices, and a protection to their loose and turgid blood-vessels, without which they would burst. When the bowels are wounded, this pressure throws out the fæces, and keeps up the intestines close to the wound. When the veins or arteries are wounded, it prevents the blood spreading into the abdomen, confining it in particular sacs, and forming clots close round the wounded vessels. It is this universal pressure, also, which, when the belly only is wounded, (and not the bowels), prevents the access of air; so that air does not enter, even to fill up the room of the very piece of intestine which is forced through the wound. And this, perhaps, among others, is one cause why hydatids, which are generated by the bursting of the pregnant ones, do not fall downwards in the abdomen, from the upper parts where they are commonly lodged, but are found more commonly on the liver, and sticking about the higher regions of the abdomen; while there is but one instance, I believe, of a hydatid having gotten down into the pelvis, betwixt the rectum and bladder, so as to choke the bladder, and cause a suppression of urine which proved fatal.

Perhaps this doctrine, about the admission of air and its dangerous effects, has been allowed to pass unquestioned, for its father's sake, that having been hitherto granted on his authority, which I shall be so adventurous as to deny, viz. "that air is a fluid so acrid and stimulating, that, being admitted into a shut sac, nothing can equal its terrible effects."

\* Any person, at all acquainted with the economy of respiration, will have observed that I have marked this in a particular manner; that, though the pressure and relaxation is indeed alternate, with regard to the lungs, it is continual and unremitting, with regard to the abdominal viscera, and all the parts connected with the abdomen, which are as much pressed during expiration, as during inspiration.

That the vulgar should believe the first superficial impression that strikes them, of air hurting a wound or sore, is by no means surprising ; but it is not natural that men, bred to philosophy, should allow so strange an assertion as this, without some kind of proof : that the air which we breathe, and which we feel upon the surface so bland and delightful, should have so opposite a relation to the internal parts, that it should there be a stimulus more acrid and more dangerous than the urine or bile,—is not to be believed upon slight grounds. I do affirm, that it remains to be proved, that this fluid, which seems so bland and pleasant to all our senses, and to the outward surface, is yet a horrible stimulus, when admitted, as a celebrated author grandly expresses it, “into the deep recesses of our body\*.”—“This stimulant power of the air is the reason,” says he, “why I have always inculcated in my Lectures, but, most especially, since that period (viz. the year 1771)†, the advantages which would attend the exclusion of the air from the deep recesses of the body, in performing DIFFERENT operations, and in treating wounds ACCIDENTALLY INFLICTED.” That all this is not impossible in nature, we must acknowledge : but the author, from whom I quote, will, I am sure, forgive me for saying it is not proved ; I am entitled to say, that it is not proved ; and, from the following observations, I am even inclined to believe, that the doctrine is absolutely false, and all the conclusions from it, dangerous and quite wrong.

The air, for instance, escapes from the lungs in a fractured rib, and first goes abroad into the thorax ; then into the cellular substance ; then the emphysematous tumor appears ; but often, without any scarifications, with very little care or assistance on our

\* *Vide* Monro's *Bursæ Mucosæ*.

† One man is known by one quality, or failing, another by another.—Heister is remarked for sober, systematic writing, after the right German fashion ; Petit for good sense, and sound and careful observation ; and Garengéot for tales like that about the soldier's nose. The author, from whom I have quoted the above passage, will be easily known by his attention to dates, about which he makes himself, and every body around him, quite miserable, while the lookers on can hardly understand the meaning of it.



part, the air is absorbed, the tumor disappears, and without inflammation of the chest, or any particular danger, the man gets well :—Here, then, is the air within the cavity of a shut sac, filling the thorax, and oppressing the lungs, without any dangerous inflammation ensuing.

That the air may be pushed under the cellular substance over all the body, without causing inflammation, is very plain from the more desperate cases of emphysema, where the patients, after living eight or ten days, have died, not from inflammation, but from oppression merely, the body being so crammed with air, that even the eye-balls have, upon dissection, been found as tense as blown bladders. We have also many ludicrous cases of this kind, which prove this to our perfect satisfaction. Soldiers, or sailors, sometimes touch the scrotum with a lancet, introduce a blow-pipe, and blow it up to an enormous size, imitating hernia, by which they hope to escape from the service. The old story of a man, who was so wicked as to make a hole in his child's head, and blow it up, that he might show the child in the streets of Paris for a monster, is well authenticated ; and I have little doubt, that a fellow, who knew how to do this, would blow it up every morning, and squeeze it out when he put the child to bed at night. Some villanous butchers, having a grudge at a soldier, found him lying drunk under a hedge ; they made a little hole in his neck, and blew him up till he was like a bladder ; or, as Doctor Hunter describes the disease of emphysema, “ like a stuffed skin.”

The common operation of hernia (if the being exposed to air were really the chief cause of danger), is one which, in all honesty and good faith, we should give up altogether ; for it consists in opening the sac, handling the intestines, dilating the ring, and returning the bowels into the abdomen. As soon as we open the sac, we can prognosticate the fate of our patient : if the intestine be inflamed, he is not safe ;—if it be dark-coloured, or livid, he is in imminent danger ;—if it be of a sound and natural colour, he is, in some degree, safe ;—and the patient living so often, after the

intestines have been thus exposed, is a sure proof that they are but little hurt by this exposure to the air.

Bland as air is, when applied to the surface, and harmless as it now appears to be, though blown with a continual motion into what I am well entitled to call, the "deep recesses of the body." And yet one author is so extravagant as to tell us, that it is not the incision for lithotomy, no, nor the pulling out of the stone, nor all the cruelties of that horrid operation that kills the patient, but that a great share of the danger arises from the action of the air ;\* as if air, bland as it is, could stimulate the urinary bladder, which is both accustomed to bear the acrimony of the urine, and to bear it with ease, inasmuch that it is stimulated rather by the quantity than by the quality of what it holds ; the bladder, too, which is so far from having any high degree of sensibility, that we can inject our alkaline water into it with but little distress to the patient.

Though "it is, no doubt, the nature of an hypothesis, when once a man has conceived it, that it assimilates every thing to itself as proper nourishment ; and from the first moment of your begetting it, it generally grows the stronger, by every thing you see, hear, read, or understand ;" yet this natural facility of temper, which every speculator, but most especially every medical speculator, should be willing to acknowledge, is but a poor apology for carrying an unproved doctrine, like this, such extravagant lengths ; and driving with it full career, into the midst of surgical practice, reforming, or at least changing, the manner of every great operation. The catalogue of operations, which have undergone this reformation, is curiously drawn out by an author of very high character, after the following manner : "A, Openings into the knee joint. B, The trepan. C, Emphysema and empyema. D, Openings into the pericardium. E, Wounds of

\* "There likewise seems to be strong reason for supposing that the danger, not only in the high, but in the lateral operation of lithotomy, may be lessened, by the surgeon using every means to exclude the air from the wound and bladder, during these operations, and by stitching the integuments after the high operation." *Monro's Bursæ Mucosæ.*

the abdomen. F, Cæſarean ſection. G, Lithotomy. H, The operation for hernia of the groin or thigh.”

Theſe are the operations which have been put upon the new eſtabliſhment ; and from ſome of theſe new operations I ſhall give ſhort extracts, chiefly, in order that it may be known, that however ill this flight refutation may be managed, the arguments and innovations, propoſed on the other ſide are puerile beyond all conception.

B. The improved operation of the trepan, is this, “ That the ſurgeon ſhall deſiſt from ſawing, when the innermoſt lamella becomes thin ; and then ſhall break it up with the levator or forceps \*. Here there are three points to be ſettled, before the improvement can be acknowledged or received ; that the breaking up the bone, as we punch out an old tooth, will prevent air getting in, or will prevent harm to the dura mater ; and alſo, that there are ſurgeons ſo ignorant, and ſo raſh in an operation, which requires no kind of haſte, as to drive their trepans through the dura mater, and of courſe into the brain ; or it muſt be proved, that after cutting up the depressed piece of ſkull, the air will get into the brain, which we know well it cannot do ; for the inſtant that the preſſure of the ſkull, which preſerved the balance, is taken off, the brain riſes ; and if the dura mater be entire, this riſing makes the dura mater in every caſe that I have ſeen, as tenſe as a drum, and makes it bulge ſo through the trepan hole, that it is in danger of being cut upon the edges of it ; if the dura mater be cut, then the brain itſelf protrudes. Or, laſtly, it muſt be proved, that air is the cauſe of the fatal inflammation ; which it will not be eaſy to accompliſh, nor very wiſe in any ſober man to

\* “ In the operation of the trepan, I have adviſed that the cranium ſhould not be entirely cut with the ſaw ; but that the operator ſhould deſiſt from ſawing, when the innermoſt lamella becomes ſo thin that it can be eaſily broken off with a levator, or forceps, by which we not only avoid the danger of the inſtrument preſſing rudely on the brain, but alſo, in many caſes, the cutting of the dura mater, and admiſſion of the air to the ſurface of the brain, which experiments I made on HALF A DOZEN PIGS, near THIRTY YEARS AGO.” *Monro's Burſæ Mucoſæ.*—N. B. Pigs have but one table in their ſkull, or no tables at all.

attempt ; for inflammation often comes on where there is no fracture, where no air is admitted, because no operation is performed.

The true causes of inflammation are these : There is first the terrible blow ; there is a crushing and fracture of the bones ; there is that hurt of the dura mater, which is inseparable from a fracture of the bones of the cranium ; and there is a piece of the skull cut out with the trepan, which, when it is separated from the dura mater, leaves that membrane bleeding at a thousand small points ; all the little arteries, passing betwixt the dura mater and the skull, being torn. We must forget that there are any such accidents as these in our operation, before we can ascribe the inflammation to the admission of air.

But even granting the value and high importance of this improvement, how little credit the author of it, as he calls himself, should have, may be understood by the following translation from Hippocrates : “ Nor is the perforation to penetrate entirely into the cranium, lest the dura mater should receive some injury, either from the INSTRUMENT, or from a long exposure to the AIR. To avoid this last inconvenience, by which it is often putrified and destroyed, the piece of bone within the tenebra should be suffered to remain till it comes off of itself \*.”

C. “ In the case of air infused into the cavity of the thorax, it is advised that the operation should be performed with a small trocar † ; instead of which cautious method (says this author)

\* Riollay's Hippocrates, p. 63.

† “ In the case of air effused into the cavity of the pleura, for which, so FAR BACK AS M,DCC,LVIII, I ventured to propose the paracentesis of the thorax, I have advised that the operation should be performed with a small trocar passed cautiously in a slanting direction ; and, after withdrawing the filette, and letting out the effused air, that a flexible canula, with a plug fitted to it, should be introduced, in order to preserve an outlet to the air till the wound of the lungs be closed ; and that, before withdrawing the canula, any air remaining in the pleura shall be sucked out with a syringe or elastic bottle. AND IN M,DCC,LXIX, a case occurred, in which, by my direction, that operation was performed nearly in this manner, with relief and success. (see an

Hewson and others, following him, have proposed an incision by a knife, which I have found even in experiments upon sound animals, generally proves fatal from the degree of inflammation, which the free admission of the cold air creates." But let it be remembered, that the author keeps the canula still in the thorax, and plugs it with a cork to preserve an outlet for the air ;—by which it is very plain, that he expects the lungs to fill the thorax with air, from time to time during the cure ; so that if there come no inflammation in any such case, it will not be from the want of air. He has told us also that small incisions or punctures are safe, though made with the intention of giving vent to confined air, and though kept open to let the air out from time to time ; while large incisions cause high inflammation :—I confess that these two conclusions seem perfectly natural, it is natural that if the incision were small, the thorax should be free of inflammation although full of air ; and again it will naturally happen, that where the incisions are large, the breast must inflame. In short, it is plain, that inflammation, or the absence of it, arises not from the presence or absence of the air, but from the length of the incision ; there is no inflammation where the wound is small, though it be made on account of confined air ; there is inflammation where the incisions are large, though they are made with the intention, and also with the effect of letting loose the confined air. There is only one thing to be wondered at, viz. that this canula fixed so carefully in the thorax was not at least as effectual.

account of this case communicated by Mr. Kellie, one of the surgeons present, to Dr. Duncan, and published by him in his *Medical Commentaries*, Vol. II. p. 427.)

"Instead of the cautious method above mentioned, Mr. Hewson (*Med. Observ.* London, M,DCC,LXVII. p. 596), and others following him, have proposed an incision by a knife ; which I have found, even in experiments on sound animals, generally proves fatal, from the violent degree of inflammation which the free admission of the cold air creates." In one experiment on a pig, the inflammation from the admission of air by a small incision, was so violent as to kill the animal, after producing an adhesion of the lungs with the upper part of the pleura, in the space of thirty-six hours. See *Monro's Bursæ Mucosæ*.



in exciting inflammation as even the largest incision ; how the pigs or men escaped inflammation I cannot conceive.

D. Points to “ cases where the air bursting out from the alimentary canal inflamed the abdomen ; and the cases are three in number.” “ In the first case, the arch of the colon had been eroded by a tedious dysentery. In the second case, two holes were formed in the jejunum, by two pins, with their points turned different ways, and tied together with a thread, which had been ACCIDENTALLY swallowed. In the third case, of a person in a typhus, the colon seemed to have burst, during the operation of an emetic.” This is the whole and full account of these cases as delivered by the author. A tedious dysentery, with an erosion of the colon,—pins tied cross-ways, and sticking firm in the intestines,—and the arch of the colon burst, and pouring out its contents, its foul air, faeces and all, into the cavity of the belly ; these are curious examples of air causing inflammation. And I must say, that the physician has known little of practice who has not seen patients die in dysentery, without the gut being eroded, or who has not seen emetics in typhus do the business, without any bursting of the colon.

E. That inflammation is, after the operation of Cæsarean section, the most frequent cause of death, it is neither hard for us to acknowledge, nor at all difficult to explain. The very directions which the author gives, imply at once a tediousness and a rudeness in the operation, which must cause inflammation of the belly, an accident which is but too apt to happen, even when the operation is performed in the most gentle manner. The directions which the author gives for the operation, are to cut, first through the skin, then through the muscles, then through the arteries, then to plunge the hand at once into the womb, to get out the child ; again to get out the placenta ; still a third time to dilate the orifice of the womb ; and after these dreadful incisions, and all this tedious work, he tells us, very calmly, that the inflammation arises from the air. Doctor Aitken put the finishing hand to this joke, when, in his book, ON THE PRINCIPLES OF SURGERY, he advised that we should perform the Cæsarean section under the cover

of a warm bath, the woman lying under water to exclude the air. This, though it may seem to be a scurvy piece of wit, was really proposed in sober, serious earnest.

The admission of atmospheric air as a stimulus, when compared with the great incisions of lithotomy,—of hernia,—of hydrocele,—of Cæsarean section,—of the trepan, is no more than the drop of the bucket to the waters of the ocean. And it is just as poor logic to say, that after such desperate operations, these cavities are inflamed by the admission of air, as it would be to say, when a man were run through the pericardium with a red hot poker, that the heart and pericardium were inflamed “by the admission of air.” Yet that nothing might be wanting to the absurdity of this doctrine, this also is put down among the proofs, in sober, serious earnest, according to the following quotation :

“ THE DANGER of the ADMISSION of AIR to the CAVITY of the PERICARDIUM and SURFACE of the HEART, is PROVED by the following very singular case which *occurred* to me about SIX YEARS AGO : Two men in liquor disputing about their skill in fencing, the one challenged the other to a match with pokers heated at the points, that there might be no mistake about the hits, and his challenge was accepted. One of them received a thrust under the cartilage of the fourth rib of the right side, about a finger breadth from the edge of the sternum, in a slanting direction inwards. He complained little till the third day after the accident, when symptoms of deep seated inflammation began to appear, and, notwithstanding bleeding and other remedies, CONTINUED to INCREASE. These, on the tenth day THEREAFTER, when I was called to him, were succeeded by rigour and coldness of the extremities, with a small, frequent, and intermitting pulse ; and two days THEREAFTER he died. On opening his body, a SLANTING passage was discovered on the outside of the pleura, into the mediastinum and cavity of the pericardium, in which last about five ounces of purulent matter were found. The internal part of the pericardium, and the whole surface of the heart were much inflamed ; but there was no mark of injury done to the heart by the point of the poker ; and it appeared to me EVIDENT,

that the fatal symptoms had been *chiefly* produced by the AIR ENTERING the PERICARDIUM in the time of INSPIRATION \*."

I believe, that in this case of a man wounded through the pericardium, with a poker "hissing hot," few people will be at any pains to seek for any such out of the way explanation as that of air admitted through the pericardium; and especially one must be much diverted with the notion of the air being drawn in at every respiration through a deep and slanting wound of the skin, muscles, thorax, and pericardium.

This misfortune of inflammation, running so quickly round all the surfaces of shut sacs, wherever they happen to be wounded, proceeds altogether from another cause, simple and plain to the last degree. For, in the wound of any shut cavity where the parts do not adhere, the inflammation spreads and runs its course, by a law of the animal economy which we explain very ill, when we call adhesion the adhesive stage of inflammation, representing, as the first stage of a most dangerous disease, that adhesion which is a natural and healthy action, the most natural in all the system, and the farthest from disease. Thus, in a wound of the breast or belly, in a joint, or in any shut sac, if the parts being nearly laid together, should once adhere, then there is no swelling, no pain, no formation of matter, the parts are well and found in the very moment in which they adhere; thus it is sometimes in narrow and slanting wounds. But if the wound be broad and open, or if the least thing keep the lips apart from each other, or if they run into inflammation, then the lips part away from each other, matter forms, the wound inflames, and not the wound only, but also the wounded cavity inflames; so that if it be in a vital part the man dies. If there be a high inflammation excited in any cavity, be it the thorax and lungs, or be it the cavity of a vein, if the surfaces are kept away from each other, the inflammation may go on, and so prove fatal; but if the surfaces touch each other and adhere, the part is again found and entire.

\* *Monro's Bursæ Mucosæ*, page 41.

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## DISCOURSE IV.

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### ON WOUNDS OF THE BELLY.

**Y**ET here, in describing wounds of the intestines, I have delivered but half the subject, I have still to explain to you wounds of the liver, or of the spleen, of the kidney ; of the mesenteric vessels, or of the great abdominal veins,—which are indeed easily explained ; for the inward bleeding, in all these wounds, is the greatest danger ;—and the bleeding may either be immediately fatal from mere loss of blood, or the blood, exuding in lesser quantities, lies clotted in the abdomen, is as a foreign body there ; and thus, the inflammation, which is caused by the fæces in wounds of the intestine, is produced by blood, in wounds of the liver or spleen.

This enunciation of these wounds reduces whatever remains to be said, to the most perfect simplicity ;—divides them into two classes, the wounds with immediate bleeding, and the wounds followed by slow inflammation ; and leaves but one thing to interrupt the subject, viz. the condition of the extravasated blood, how it lies in the belly, and by what accident it causes death.

If the liver or vena cava be shot, then there is a dreadful bleeding, which will be immediately fatal ; for, after a ball has pierced the liver, the patient sinks, as if the ball had absolutely wounded the great vein itself : The patient feels little pain ; he grows pale and cold ; he swoons, from the inward loss of blood ; the belly fills with blood, becomes tense and hard ; the man languishes in this coldness and fainting, for a day, and expires : Often, the blood begins to flow from the outward wound ; and, whether you permit your patient to bleed thus outwardly, or close the wound, that he may die a more lingering death, makes but a few

hours of difference in a wound, which is so surely mortal. A wound of the spleen, liver, or vena cava, is as deadly as a wound of the heart, so full are they of blood.

But the blood may issue from the wound of some less important part ; perhaps, it flows from a wound of the mesentery, from the vessels of the stomach, or from a wound of the kidney, or of the emulgent vein. The flow of blood, from such vessels as these, is slow, and so far safe, being moderated by that resistance and universal pressure, which I have lately explained ; the blood flows slowly ; it is seldom suspected or perceived ; clots are formed about the bleeding veins ; and the patient slumbers, without pain, or apprehension of pain, for many days. But the patient and surgeon are roused from this state of ease and security, by ugly symptoms ; for, on the fifth or sixth day, the patient becomes uneasy, his belly swells ; he begins to vomit ; the dreadful pains come on, and the surgeon gives up all for lost, without knowing any possible cause for these alarming symptoms. But if the surgeon be careful in examining the abdomen, and fix his attention where the patient complains of pain, he will find a tumor there, more distinct than could be expected from such a cause.

The course of these symptoms is very easily explained. The patient slumbers in ease and safety for six days ; till then, no tumor, no swelling, no pain, no one sign of danger appears, because the inward bleeding has reduced him to this low and slumbering state, because the blood runs into the abdomen warm and mild, and is not felt as a foreign body :—But the blood soon gathering into the form of crassamentum and serum, the serum becomes acrid, the crassamentum lies heavy among the bowels, like a hard cake,—the inflammation begins, and this tumor being felt on the fifth or sixth day, the belly inflames on the eighth or ninth ; on the tenth day the patient is in extreme danger :—There is the dreadful pain, the *miserere mei* ; on the eleventh or twelfth day, the patient, after all the signs of gangrene, expires.

Sometimes the surgeon, notwithstanding the confusion and uncertainty of these signs, adventures to open the tumor, thrust in his finger, and so discharge the blood ; and, for his encourage-



ment in this bold operation (where he has so much to answer for) there are cases on record, where the surgeon has cut out two, three, or four pounds of black and coagulated blood, and his patient (after an incision too of several inches long) has survived;— and a surgeon, moreover, cuts with some degree of security; for the universal pressure of all the bowels prevents the blood from going out wide into the cavity of the abdomen, and collects it into separate clots and tumors of blood lying directly over the wounded vessels, and supported by the turns of the intestines and mesentery, which are immediately below; the blood is not permitted to fall down into the pelvis, but is collected into clots at the wounded part; there, of course, the incisions ought always to be made, by enlarging the wound itself.

I have hitherto dealt only in general principles, and have explained to you the two great dangers, the effusion of the *feces* into the cavity of the belly, and the effusion of blood; the former a violent stimulus, exciting sudden inflammation, the latter a slower stimulus, exciting inflammation, after an interval of many days of ease and quiet, often cutting off our patient, when we have no apprehension of danger. I shall refrain from detailing and explaining fully all the other points, which, however it might waste your patience, never could exhaust the subject. I shall rather try to sum up the whole business in aphorisms, reciting briefly the points which are already discussed, and adding, in short rules, the doctrines of such wounds as are not yet explained.

1<sup>st</sup>, WOUNDS of the LIVER are mortal; for, considering the nature of this viscus, how full it is of blood! the *cor abdominale*, as it has been called, how can there fail to be a profuse bleeding? indeed, the wound of the liver is like the wound of a great vein. No doubt, a ball sometimes passes through the thick substance of the liver, without causing immediate death; or, perhaps, the patient survives, because the great vessels are not wounded; or because the blood flows very slowly from them, and coagulates in the wound; perhaps the bruising of the shot deadens the vessels; or, perhaps, the swelling of a penetrating wound, in a substance so soft and spongy as the liver is, closes the sides of the wound,

so that the bleeding stops. However this be, we are sure that patients have lived twenty days with wounds fairly across the liver; and sometimes, after wounds, where the liver must have been wounded more or less, the patient has recovered. Yet these are exceptions merely to this general rule: Wounds of the liver still are to be declared mortal; there is a great inward bleeding, the patient immediately sinks and faints, languishes in a slumbering state, insensible almost, and without pain, lies cold and death-like, for, perhaps, twenty-four hours, and then expires.

2d, Wounds of the SPLEEN, or VENA CAVA, are alike fatal with those of the LIVER, and the signs of internal bleeding, from any of these, are precisely the same; and when a man dies, from the passing of a chariot-wheel over his body, or is killed in boxing, or, after a great fall, is taken up dead; or when a man has been struck in the belly, and killed by a great ball, which has not wounded the skin, in all these (which I consider as parallel cases) the hurt is often found to be in the liver, vena cava, or spleen, or kidney, any of which being burst, pour out so much blood, that the patient dies.

3d, BLEEDINGS from wounds of the MESENTERY,—KIDNEY.—EMULGENT VEIN, or any smaller vessel, are often slow and gentle, and are not known by the common signs of inward bleeding. The patient continues easy, and his belly soft, for some days, till the blood coagulating, either by the weight of its coagulum, or by the acrimony of its serum, excites inflammation; so that, on the sixth day, there comes pain, swelling, hardness of the abdomen, quick pulse, fever; at last the torments of the miserere mei, and then gangrene, and death.—And here it may be noticed, that if there be immediate fainting on receiving the wound, and then coldness, accompanied with a continued faintness, swelling of the belly, and oppressed breathing for some days, most likely, there is blood, extravasated, and in dangerous quantity, from some greater vessel:—But if the patient have lain easy, and there comes pain, swelling, fever, and other threatening signs, on the sixth or seventh day, with a tumor in one part of the belly, it is most like-

ly a bloody tumor, which has begun to excite inflammation, and the blood must be cut out. If there be pain and swelling on the first or second day, it is from wounded intestine ;—if there be pain and swelling, but not till the sixth day, it is from blood ;—if there be no pain, nor swelling, till after the fifteenth day, our patient is almost safe.

4th, The signs of a wounded stomach are a burning sensation at the pit of the stomach,—heat, thirst, and a feverish pulse, great irritability of the stomach, and vomiting so intense, whenever the mildest things are taken down, as to throw the whole frame almost into convulsions. These are the chief signs of a wounded stomach, together with bloody serum thrown up, and blood passing by stool ; and in the end, extreme weakness, faintings, a low, quick and fluttering pulse, swelling of the belly and hickup, and commonly death. Yet often during all this violence and straining continued for weeks, not one particle of food goes out into the belly ; no doubt, it cannot always happen thus, but it often does.

5th, When the intestines are wounded, the escaping of the feces declares but too well the nature of the wound ; and too often there comes on an inflammation, not so limited, as merely to make the intestine adhere, but diffusing itself over all the belly, whence come knottings and adhesions of the intestines, swelling of the belly, fever, pain, the *miserere mei*, inward mortification, and death.

6th, Wounds of the bladder are always, or almost always, mortal ; for the bladder both discharges its contents by its own contractile power, and lies very low in the pelvis : it throws out its urine into the cavity of the abdomen, which is a fluid so highly stimulating, that inflammation and mortification of the bowels are not long delayed.

7th, The wound of the gall-bladder is like this ; for its fluid is stimulating in a still higher degree, and the patient very seldom escapes the quick and deadly inflammation ; the urine or the bile act like poisons thrown into the abdomen, the patient dying a most miserable death.

Thus the prognostic of danger goes downwards, according to the succession of parts ; those which are most important in the animal economy being affected in the higher wounds.

Wounds of the liver and spleen are deadly, from the inward bleeding ; wounds of the stomach are hardly less mortal, for there is both a bleeding, from its numerous vessels, and danger of its food being poured out into the abdomen ; there is great danger of inflammation also from the mere wound. The wounds of intestines are less dangerous ; for though the faeces are sometimes poured out, so that the belly inflames, though the inflammation, which should heal or unite the intestine to the abdomen, often spreads over all the surfaces, yet they are safer than wounds of the stomach ; for the intestines are quick in their inflammation, the peritoneum, by a wise provision of nature, is apt to inflame ; there is, at such a time, a sort of sympathy, like a contagion, among the contents of the belly, so that, towards whatever point this wounded intestine is turned, it meets with parts ready to inflame, and thus the wounds of the bowel and of the belly inoculate, and the patient is saved.

The great intestines, lying lower in the abdomen, are less dangerous still ; they are bound down in their right place, they are behind the peritoneum, and they lie upon the thick flesh of the lumbar muscles, so that their wounds quickly heal. But still it must not be forgotten that, though neither the liver, spleen, stomach, nor bowels are wounded, inflammation may come on merely from the hurt done to the peritoneum itself ; after a wound of the belly the patient can never be without danger.

There is but one thing more relating to the prognostic, in these wounds, which you should endeavour to remember, viz. that the stomach, by its sinking, is apt to spill its contents into the belly. The intestines are less apt to do so, for they are held steadier in the abdomen ; the urinary bladder discharges into the abdomen, because it is emptied by its own contractile power ; the gall-bladder must spill its contents when wounded, for there is nothing that can hinder the bile from flowing. The bile is the highest stimulus, the urine next, and the food and the faeces are

less irritating, and the blood least of all; and, perhaps, it is according to this order that the dangers of these wounds should be calculated, effusions of bile being the most dangerous,\* wounds of the urinary bladder next to these, wounds of the stomach and bowels come next in order, and effusions of blood are the least dangerous as a cause of inflammation, if only the bleeding be not so profuse as to endanger life.

Lastly, If the ball remain in the belly, though the patient escape through the first dangers, he is never safe; for the ball being lodged about the loins, in the heart of the muscles, causes carious bones, fistulous ulcers, and running of matter, with a hectic fever, (which cannot stop while the ball remains), so that this is a very hopeless case.†

Now, before I lay down the few short rules which relate to the practice, it is my duty to remind you, that we can do but little in the cure, nature herself cannot do much, we are as spectators merely, and every recovery is truly an escape.

Surgeons have boldly cut into the stomach, and extracted knives which had fallen down into it: foreign bodies of all kinds have made their way safely through its walls; soldiers have often recovered, whose stomachs had been so wounded with the sabre that the rice, or barley, or meat, which they had taken at last meal, has been cast out through the wound; and the older surgeons tell us that, in broad wounds of the stomach, they had sewed the wound together with many stitches, sewing the wound of

\* I saw a man die in a very miserable condition, who had, by a fall, torn the gall ducts, so that the abdomen swelled with dreadful pain: the most thorough jaundice I ever saw; and the abdomen, when opened, was full of bile, serum, and coagulable lymph,—the intestines universally turgid, of a yellow colour,—universally inflamed,—adhering at some points, and gangrened in others.

† In opening the body of a young gentleman, who had been wounded in a duel, who had survived his wound a whole year, lingering in a very sickly condition, till at last he was cut off by a hectic fever,—we found the ball (which had passed in at the groin) lodged under the psoas muscle, upon the inner surface of the haunch bone, and surrounded with many sacs of pus.



the stomach to the external wound. There are not wanting cases, where the wound of the stomach having been prudently managed by the modern surgeon, the general pressure has kept the stomach up to the wound, and adhesion has completed the cure ; sometimes wounds of the liver have healed ; and often the surgeon has cut out, safely, very large collections of blood ; the intestines have so often adhered, without the help of such stitches, that, as I have said, you find anuses at the groin, and miraculous recoveries in every book ; and read of cures, till you forget that there are dangers.

1st, Bleeding from the arm is the great preservative against internal bleeding, and is the only means of preventing inflammation ;—in every wound of the abdomen, you must bleed with a very liberal hand.

2d, Quietness, rest, and opiates, with fomentations to the inflamed belly, are next in importance to bleeding ; and the belly must be kept open with gentle glysters, but never with laxative medicines, lest they should purge.

3d, The patient must very resolutely refrain from all food, for ten or twelve days ; for diet would support the strength, encourage the inflammation, and disturb the wound by a flux of fæces, which might, perhaps be thrown out into the cavity of the abdomen itself. The patient must refrain from food, then, that the intestines may not be moved. He must be nourished with glysters ; or if he takes any thing by the mouth, let it be some jelly or soup, which, though it were to go out into the abdomen, might be absorbed.

4th, If the wound be in the belly merely, and a sound intestine be forced out, you must put it back gently with the fingers, and stitch the outward wound.

5th, When there is a wounded intestine which you are warned of only by the passing out of the fæces, you must not pretend to search for it, nor put in your finger, nor expect to sew it to the wound ; but you may trust that the universal pressure which prevents great effusion of blood, and collects the blood into one

place ; that very pressure which always causes the wounded bowel and no other to protrude, will make the two wounds, the outward wound, and the inward wound of the intestine oppose each other, point to point ; and if all be kept thus quiet, though but for one day, so lively is the tendency to inflame, that that adhesion will be begun which is to save the patient's life \*.

6th, If indeed you have a wounded intestine fairly in your hand, protruding and plainly wounded, it were madness to let it go back into the abdomen, where there cannot but be some danger of the *fæces* getting out. But do not sew the bowel with a long future, in hopes of closing the breach, nor follow the strange and whimsical inventions of cylinders of paper or of isinglass, which it is easier to use in experiments upon dogs, than to practise in real wounds. You must make but one single stitch, and sew the wounded intestine to the outward wound,—there the gut will adhere, throw out its *fæces* for some time, and then heal, the outward and the inward wound uniting in one knot or scar.

7th, If a sound bowel have come through a narrow wound, and be inflamed and so turgid, that you cannot push it back, you must not think of pricking it with a needle or an awl, as was the custom of Parée, Dionis, and all the older surgeons ; you must perform the operation for hernia by slipping in your finger to guide the knife, opening the wound a little wider, till the intestine is free, and then stitching the outward wound after the intestine is put back.

You must take all possible pains, both about the surgery of the wound, and in keeping down the actions of the system ; for you perceive that there are such chances as make every case interesting and none desperate.

If my reader should wish to know something more than these general principles, or should desire (as we commonly express it),

\* In Mr. Hunter's book on gun-shot wounds, there is a case of a gentleman, who, having been shot through the belly in a duel, died in thirty-six hours ; and it was found, upon dissection, that, even in that very short period of a day and a half, the adhesions had formed.

to be more minutely informed, about particular wounds of certain parts contained within the cavity of the abdomen, &c. he may read Mr. Benjamin Bell's chapters upon "Wounds of the Intestines, Wounds of the Stomach," &c. and he may read that chapter upon Wounds of the Uterus, which begins with these words, "THE UTERUS IS A STRONG MUSCULAR BAG PECULIAR TO THE FEMALE SEX, BEING SOLELY INTENDED FOR THE FŒTUS."

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## APPENDIX TO DISCOURSE IV.

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### ON THE MANNER OF STITCHING AN INTESTINE.

I HAVE endeavoured to represent the real condition of a wounded bowel, and the easy cure of it, in that simple form in which I have conceived it. I have advised that one single sitch only should be struck through the wounded bowel, and then drawn also through the wound. And I have ventured, moreover, to say that, if there be in all surgery a work of supererogation, it is this operation of sewing up a wounded gut. The mechanical and vulgar conception of those who believe that a wounded intestine is closed, not by inflammation and the adhesion of contiguous parts, appears to me offensive to a degree which I shall hardly venture to express to you. But it strikes deeper and wider than this ; it is not offensive only, it is dangerous : for while I take an interest, and find only a pleasant labour in teaching the young surgeon what is right to do, and what is consistent with the simple ways of nature, and the economy of the living body, he is seduced by a formal account of most curious and ingenious methods of sewing a gut, and is drawn aside to follow after such puerile conceits, thinking to do more than even nature can do in such a case. He reads, in the system of a celebrated author, that “ their opinion is ill founded who would rather trust to nature for the cure of a small opening in the gut, than to insert a ligature, inasmuch (says the author) that I would not leave even the smallest opening that could admit either chyle or fæces to pass without STITCHING it up.”

These things cannot be left unsettled, without danger ; they cannot be explained, without explaining and refuting also, wherever it is required, the opinions of authors ; and again, it is impossible to explain those things, without allowing such expressions

to escape, as are often more dangerous to the man who uses them, than to the man who suffers them ; and which no generous mind can think of using without regret : yet, what shall we say of a man, who adventures to write on a learned profession, while he is himself totally ignorant ; who writes boldly through the whole circle of the human body ; of wounds which he has never seen, and of viscera which he has never handled ; who supplies his want of knowledge by bold conjectures only ; who tells us, “ that when the spleen is laid bare by a wound, it is easily discovered, whether it is wounded or not ; that a division (i. e. a wound) of the duct of the pancreas will, by interrupting or impeding digestion, do much injury to the constitution ; and as the liquor *will* be effused into the cavity of the abdomen, it may thus *be productive of collections*, the *removal* of which may require the ULTIMATE assistance of surgery : That wounds of the receptaculum chyli will be distinguished by the discharge of a milky liquor, and that they can never become the OBJECTS of surgery ; but by producing collections in the abdomen, which may require to be DISCHARGED : That the discharge from the receptaculum chyli is altogether white like chyle, or mixed with a considerable portion of it ; and that the patient becomes daily weaker THAN he OUGHT TO DO from a wound of the same size in any other part, owing to the nutritive part of the food being carried off before any advantage is derived from it \* ?” Who tells us, concerning the mesentery, “ That in its wounds the discharge of *chyle* or blood into the cavity of the abdomen, is what we have most to dread ; and

\* “ With a view, says the author, to prevent the diameter of the canal from being distended, which, at the same time, will lessen the extent of the wound, the patient should be kept upon a very spare and cooling diet.—Any food, which he takes, should be not at regular meals,” &c. &c. Is not the accuracy and carefulness of observations, such as these, especially meritorious, since they are all concerning things which the author has never seen,—never heard,—never read of,—cannot understand ? Since this same receptaculum chyli is nothing, it is only a name which the older anatomists used, before they knew the part rightly ; and now they find, that there is no such thing as a receptaculum, or bag.



that, whenever any portion of the mesentery is **PROTRUDED**, it should be examined with **ACCURACY**;—and whenever any of its vessels are found to be divided, they should be **TIED** with **LIGATURES**,” &c. ? As for “wounds of the liver, they are apt, we are told, to prove particularly hazardous, from their allowing the bile, which is very **SOON RENDERED PUTRID**, to be poured into the cavity of the abdomen.” “And wounds of the gall-bladder are more dangerous, only as they are **MORE CERTAINLY productive** of **EXTRAVASATIONS** of bile into the abdomen.”

These observations are unparalleled in all the books of surgery, from the invention of printing down to this present day. The author talks of the spleen laid bare, as if it were some fixed viscus, or one which could be seen, while it absolutely lies among the deepest in the abdomen, and cannot be drawn out into view, even in the dissection of a dead body, without thrusting down the hand for it ; he talks of the pancreas as if it could be hurt without a most complicated and absolutely fatal wound ; of the thoracic duct, as if it could be injured without a wound of the aorta, heart, or spinal marrow ; and of the receptaculum chyli as if it were a part really existing, while it is merely a name, used ignorantly by the older anatomists, and forgotten now ; and, he not only describes how the patient survives such wounds, but how gradually he wastes, and what means the surgeon is to use for his recovery : he talks as if the pancreatic duct could fill the abdomen with its saliva, or as if the thoracic duct could fill it with chyle ; as if the mesentery could really protrude by itself ; or as if the liver, as well as the gall-bladder, gave out bile. These things lying all now before me, all in one single chapter, have inclined me, most uncharitably, to call it a curious specimen of the art and mystery of writing surgery (and anatomy to boot) by conjecture and mere guess ; these grosser faults have, at least, weaned me thoroughly from that kind of prepossession, which some people indulge in favour of every thing that is in print ; and this, in its turn, will enable me to speak confidently about the remaining errors in this chapter, upon wounds of the viscera ; for once more I affirm, that it is impossible for the young surgeon to receive willingly, or

to follow confidently, this simple method of sewing an intestine, which I commend, while other methods appearing to him more curious, more ingenious, or more secure, are left unrefuted.

This author first directs us to learn what is, according to his system, a thing very essentially necessary to be known, viz. which is the upper, and which is the lower end of the gut :—"For it is necessary, in reuniting the intestines, to know which is the upper end ; but it requires some attention to make the distinction. The peristaltic motion will be observed to be more remarkable in the upper division than in the under. But the most certain method is, to observe at which of the ends the fæces or chyle are evacuated," &c. &c.

There are some little things wanting in this explanation ; for the author should have told us, in the first place, how much of each end of the intestine must be hanging out in this easy negligent fashion, before we can compare the peristaltic motion of the upper end with that of the lower ; must we learn to know, at one glance of the eye, whether the peristaltic motion be fast or slow ? and whether it be such as belongs to the upper end of the intestine ? how, or in what animals, and by what kind of experiments, shall we learn this ? has this author ever seen the peristaltic motion thus regular ? has he ever seen chyle, so that he could swear to it, that it was chyle ? can he pronounce, from which hand the fæces and flatus come in an accidental anus at the groin ? Now, my reason for asking these questions, is a very humble one, viz. that I never saw chyle in the intestines (in the delicate vessels, the lacteals, indeed, it is easily seen). I have hardly seen this peristaltic motion, even in animals, when opened on purpose, and positively never in the human body ; and when I have chanced to see an anus at the groin, I never could distinguish, whether the fæces, and froth, and flatus, which issued from it, came from the right hand or from the left ; they came from the general opening.

However, it must be acknowledged, that this author really has good reason to be careful about this matter ; for his operation,

which proceeds upon it, is a very desperate one : He advises the surgeon to seek out the upper end of the intestine, or the end that may be wanting, not only by putting in his fingers, but by cutting up the wound ! “ I am clear,” says he, “ however, that this (*viz.* the putting one stitch into the end of a wounded intestine, so as to hold it in contact with the outward wound) will not prove satisfactory to the feelings of any practitioner, possessed of that degree of fortitude which our art requires, and who has that regard for the safety of his patient, which every surgeon ought to possess. And, although I have advised, in wounds of the intestines, when no part of them protrude, where we cannot, therefore, know whether the wound be large, or only a small puncture, and where the injured part may be so situated, that it could not be reached, without opening the GREATEST PART of the ABDOMEN, and turning out PERHAPS the whole alimentary canal, that we had better allow the patient to have the chance of recovering, without any attempt to make a discovery, and which he may do if the wound is small, than to propose a measure, which, of itself, might be attended with more hazard than the injury for which it was meant to be a remedy ; yet, when we are rendered certain of the gut being completely divided by one end of it hanging out of the wound, as this will give much cause to imagine that the other is at no great distance, I think it ought, by all means, to be searched for, by enlarging the external wound, so as to admit of the fingers of the operator being freely inserted. Even where the upper part of the gut is protruded, it is worth while to submit to this injury, merely in order to have at least some chance of avoiding the loathsome inconvenience of an artificial opening for the *æces* : And, where the upper part of the gut has slipped in, the patient can have no chance for farther existence, if it be not discovered. In such a situation, therefore, we should not hesitate as to the measures.”—I will not, as I have formerly professed, quarrel with this author about many trifling faults, which I rather choose that my reader should have all the merit of discovering, without being beholden to me ; but I cannot refrain from saying, that this is not the prudent way of addressing young men,

who are but too apt to do adventurous things upon slight authority. But this is not all ; other curious improvements follow close upon the heels of this important discovery ; for, as soon as the surgeon has found out the upper end of the gut, he is to thrust the upper end of the gut within the lower end, an inch or two, just as he would push in the sliding end of an opera-glass ; and, that the ends may go neatly within each other, a roll of isinglass or tallow is to be put into the gut ; and, that they may remain unmoved for some time, they are to be well and soundly sewed with a good needle and thread all round. Indeed, to read this, any sensible man must believe, that I spoke in mere ridicule, and described this firm sewing of the gut dishonestly ; but I shall, as usual, give the quotation,—let the author speak for himself :—“ In this situation, it would be difficult to draw the divided parts together with a needle and ligature, without hurting the opposite sides of the gut, in any other way than by keeping it extended by means of some round body inserted into it. For this purpose, it has been proposed to make use of a tube of thin pasteboard or paper ; but as this might be laid hold of, and kept firm by the ligature, a small roll of tallow is preferable, as it will afterwards melt and pass easily off with the fæces. A piece of it, nearly equal to the diameter of the intestine, should be inserted into the end of the upper portion of the gut, and, being afterwards passed into the other, so as to carry the one to the extent of an inch, or thereby, fairly into the other, the two portions should now be STITCHED together with a small needle, armed with a fine thread, The stitches should be carried COMPLETELY ROUND the gut ; and, in order to give them as great a chance as possible of succeeding, they MIGHT EVEN GO TWICE ROUND ! first, at the edge of the under portion of gut ! and afterwards about an inch beneath, near to where the upper part of it terminates !”

From all which it is very plain, that the mechanical notions of this author are utterly incorrect ; that he has no conception how a gut adheres, nor how that adhesion may be assisted by a single stitch, nor how impossible it must be for a gut to adhere, or to do any thing indeed but mortify, by being stitched all round, and

stitched even with a double row. That a man, who has no conception of a gut being sure in any other way than by the firmness of his own stitches, should propose a double row of stitches, is not wonderful ; he should just have put a binding round it, and so finished this admirable operation.

Now, I do affirm, that the carefulness, and apparent accuracy of all this, has irresistible weight with a student, especially when enforced and repeated in every different form ; while, in fact, this way of distinguishing the upper from the lower end of a gut,—this thrusting of the fingers into the belly, this cutting up of the wound, in order to grope for that end of the gut which is wanting, this sewing it upon a cushion of tallow, and the sewing it fast and firm with a double seam, is, like the rest of the chapter, delivered upon conjecture merely ; it is an untried experiment as yet, and let it be tried when it may, I shall venture to predict, that it will turn out a very bad one \*.

\* This author adds one more speculative direction, which is of the most singular nature, and has, as far as I know, all the merit that originality can give it, that is, having sewed the gut tightly, which he never fails to do, he advises, in the following passage, that the ligatures be cut off, and the gut with the seam in it, and the thread be thrust back into the abdomen, and no more said about it. “ In this manner, says he, the sides of the wound may be drawn closely and exactly together, without lessening the diameter of the gut in any degree ; and the end of the ligature may at last be secured, and cut off close to the other extremity of the wound, if the gut is to be put freely into the abdomen, or it may be left of a sufficient length to hang out at the wound in the teguments, if it is the meaning of the operator to retain the wounded part of the intestine in contact with the external opening. This indeed is usually done, that we may have it in our power, as it is said, to draw away the ligature, on the wound of the gut being cured. It is probable, however, whatever future may be employed, if more than one or two stitches have been passed, that it will be very difficult, and even uncertain, our getting the ligature away, without hurting the intestines, more than we ought to do. I would never advise, therefore, with any view of this kind, that the ligature should be left out at the wound ; less danger will arise from cutting it entirely away, and allowing the stitches to remain. A considerable part of it will fall into the cavity of the gut ; and in such circumstances, the danger of the patient, from other causes, is so great that any additional risk, that can occur from the remaining part of it, must be so trifling, as not to deserve notice.” Benjamin Bell's System of Surgery.



I shall now return, then, to represent once more the simple mechanism of this case. As for intestines cut fairly across in all their circle, I believe the thing cannot happen, and that this, like the rest, is a piece of mere guess work : for, if I know any thing about the way, in which the viscera are disposed within the belly, it must happen, that a suture which cuts one piece of intestine fairly across, must have cut many other turns half through ; and in short, that a suture cannot cut a piece of intestine across, unless the stroke have cut up much of the belly, so much, that whether you finish with a double row of stitches, or whether you use or neglect the elegant invention of the roll of tallow, is a matter of very little importance ; but only that you had just as well spare yourself the trouble, and let the poor man alone.

The wound, slit-like in one side of intestine, is the thing which chiefly you have to do with. I have shown already, that such a wound is to be cured, not by the edges of the wound adhering to each other, for they are like mere mathematical lines, having no breadth of surface and no broad contact ; the lips of such a wound are healed, not by adhering to each other alone, but by adhering at once to each other, and to the inner surface of the abdomen. I have proved by reasoning, that the surrounding parts of the abdomen are at such time highly sensible, much inclined to inflame, and ready to unite with them ; and I have confirmed this, by showing that, in one singular example, five desperate wounds in one person healed : and there each wounded intestine adhered to some part of the peritoneum, or some other piece of gut in various ways. I have thus proved, that the mere pressure upon the viscera will keep the wounded gut so close to the peritoneum, as to make it unite. But since it is plain, that the outward wound is the part of the abdominal surface, the best inclined to sympathize and adhere with the wounded intestine, our duty plainly is, to make one simple suture very slightly through the edges of the wounded intestine, not with the absurd intention of sewing up the breach in the intestine firmly with a needle and thread, but merely to keep the inward wound of the intestine neatly and closely in contact with the outward wound, when it

will adhere,—will continue perhaps open, and throwing out its fæces for some time, but will contract gradually as the outward wound contracts, and will close effectually and soundly before the outward wound heals.

But if it should happen that a gut is cut fairly across in all its circle, which it is not impossible, but it may be, by a stab with a knife or broad sword, the mechanism of the case is this: the mesentery still has its hold upon each end of the divided intestine; and the two ends of the intestine can never be far separated from each other; nor can the one end be introduced so far within the other as to make the double row of stitches round and round, the one row distant from the other an inch. It is not by this thorough stitching that such a gut is to become sound; it is only by adhesions, and by two adhesions taking place at the same moment. The two ends of the gut may be made to adhere to each other; and the prudent way of favouring these adhesions is to introduce the one piece of intestine a little way within the other, and make one single small stitch in that part of the circle which is furthest from the mesentery, and then draw the gut by means of that thread close up to the wound, and thus it will probably happen, that the mesentery will keep its side of the circle firm, that the stitch will keep the opposite side firm, that the gut being drawn by the thread, and pushed from behind, and flattened by the universal pressure within the abdomen, the double adhesion may take place, viz. of the surfaces of the intestine to each other, and of the wound of the intestine to that part of the inner surface of the belly where it is open and inflamed by the outward wound.

Whether I have explained this simple process rightly, will be best judged of by those who are the best acquainted with the facts of surgery, as they now stand; and the method which is here proposed must be authenticated or refuted by future observations. But, on the other hand, it is very easy to foresee, that if this which I have described should really be the process of nature, the stitching of an intestine round and round cuts off at once all hopes of adhesion. How the intestine can discharge the threads of this complicated suture without total suppuration and destruction, or

rather how it can escape a total and immediate gangrene, I leave to be explained by those who have been at so much pains to explain all the rest : for there remains but one thing for me to do, viz. to make sure of my reader's having a correct idea of these two doctrines, by putting them down opposite to each other in the form of plans. Fig. 1st. explains the double future ; fig. 2d, explains the simple stitch ; (a) points out the space which must mortify, according to the DOUBLE SEAM METHOD ; (b) shows the single stitch by which we hold the two pieces of gut tight, with regard to each other, and both close up to the wound ; (c) the dotted line, marks the direction in which the gut (e) lies within the gut (f) ; (g) shows the mesentery ; (h) the way in which it keeps the two ends of the divided intestine right ; and it cannot be difficult to conceive how the stitch (b) will come easily away with little harm to the intestine, and not till after it has done its business effectually in uniting the inward to the outward wound ; so that though the breach which the stitch left were large, still the faces would be discharged easily, and it would heal gradually along with the outward wound.



# DISCOURSE V.

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## ON WOUNDS OF THE HEAD.

“**W**HILE the bones in general serve as a basis for the soft parts, and for supporting and directing the motions of the body ; certain bones have a higher use in containing those organs whose offices are the most essential to life. The skull defends the brain ; the ribs and sternum defend the heart and lungs ; the spine contains that prolongation of the brain, which gives out nerves to all the body : and the injuries of each of these are important in proportion to the value of those parts which they contain.” In wounds of the head, it is not the destruction of the scalp merely that disturbs us, nor the wound of the bone, though that of course makes a tedious disease ; it is the injury of the brain alone that is dangerous ; and the brain is hurt, sometimes, by the general shock, by the oppression of inward bleedings, or by depression of the skull, and very often, so close is the connection and sympathy of all the external and internal parts, it is hurt by the very slightest injury of the scalp or bone. Thus it comes to be a very natural arrangement to explain to you, first the indirect injuries of the brain, to explain how the hurts of the scalp or of the skull itself affect the brain indirectly ; and, secondly, how, by concussion, or any other immediate injury, there is a direct affection of the brain.

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## OF SECONDARY AFFECTIONS OF THE BRAIN.

I shall first try to explain to you, in the way of a general doctrine, how careful you should be of all kinds of wounds, and how watchful of the slightest bruises, how sparing in your incisions,

and how reserved in your operations of trepanning the skull, cutting the dura mater, or cutting away fractured bones ; for there is an economy in these things, which, in the hands of a skilful man, often saves the patient ; the want of which was a chief blemish in the practice of older surgeons.

It is as a general doctrine, (but not as a mere theory), that I would explain to you the intimate connection and sympathy betwixt the integuments and skull, and through that with the brain. It is a doctrine which should guide you not only in the slightest wounds, but in every step of your boldest operation. You must not hold off the edges of the wounded scalp from each other, for they will inflame and suppurate with loss of substance ; you must not keep the wound open, lest that should hurt the bone ; you must not trepan too much, lest you hurt the dura mater ; you must not open the dura mater on slight occasions, lest there come a protrusion of the brain ; for the brain is exposed, and the balance and support to it is lost whenever you take away too much bone : The skin, the skull, the dura mater, are equally integuments of the brain ; they should be each more respected, as they are closer to the brain ; and none of them should be wantonly injured, because they have all a close relation to each other, and the most distant has its connection with the brain ; and none of them should be rashly taken away, for it is a loss which never can be repaired. By saving the scalp, you prevent exfoliation, and a plug is sometimes formed to replace the part of the skull ; but where neither the scalp nor the skull are spared, the inflammations of the membranes, the sloughings from the dura mater, and the protrusions of the brain, are such as to cause long suffering, and an imperfect cure in those few who escape after this kind of surgery.

The range of this, as of every true doctrine, is of great extent, and the comparative view which it suggests of the ancient, and modern surgery, as it relates to this point, is not uninstruative.

No sooner was a drunken fellow, who had been revelling in the streets, carried with his head broken to any great hospital, than he was scalped ; and, as Mr. Dease tells us seriously, they had him all ready by the morning visit for any thing which



might need to be done ;—he was scalped in the evening,—his fractured bone was scraped and examined in the morning,—and, in the course of twelve hours, without knowing who he was, or what he was, or how wounded, or almost whether he was ill or not ! If there was but a slight fracture on the head, he was trepanned : and if, during this short process, he chanced to awake, he found himself struggling among a set of good sturdy assistants, who were less curious about understanding what he might have to say in his own defence, than in keeping him firm down upon the table, and occasionally cramming his mouth with a handkerchief when they thought he roared too loud.

It is but a few years ago that these practices prevailed : the surgeon cut off every piece of scalp that was hurt, or cut even with a clean incision. If he performed the operation of the trepan, he thrust in syndons into the hole, lest it should heal, for then it was their rule that the surgeon should not incase the wound till after forty or fifty days, in short, till all the loose pieces and the trepanned circle of bone should have exfoliated and come away. By their cutting away the scalp, by their large trepannings, which they boasted of as their greatest work, by their scraping with trepan irons, to hasten the exfoliation, and by their anxiety about procuring a due concoction of matter, by their masterly attempts at exfoliating the bone, which they performed chiefly with red hot irons, and the unavoidable delays of making new openings and cutting off the fungous excrescences, they made a very tedious business even of the slightest case.

It is no wonder, that surgeons, who were thus afraid of closing the wound till the bone had exfoliated, were much averse from sewing the scalp ; but you know, from what I have formerly explained to you in describing sabre wounds, how safe it is to lay down the wounded scalp, how safe to settle it with stitches,—how easy to cut these stitches out if the scalp do not adhere, how soon all danger vanishes, and yet the danger is not slight, as you may easily be able to conceive from the comparison of the old with modern practice. For the scalp, being either held off from the skull, or being entirely cut away, left the bone naked ; the exfoli-

ation required six, eight, or ten months, more or less, according to the circumstances of the case ; and during all that time the patient was upon the brink of danger : The dura mater was always liable to fall into disease even during the first stage, i. e. during the exfoliation of the bone ; when the bone exfoliated, the brain, or at least the dura mater was laid bare, with a degree of danger exactly proportioned to the loss of bone :—The least accident was apt to hurt the part,—the least irregularity inflamed the brain,—a constitutional disease, or even the bad health, proceeding from confinement, the air of an hospital, the slightest error in the dressing, was apt to corrupt the membranes, and produce fungi, and retard the healing of the sore : many a change did such a sore suffer during the tedious cure, and every rising of the pulse, every slight headach, every change upon the wound, alarmed the surgeon ; it is easy to conceive what numbers died, how difficultly and how imperfectly a few were cured, how critical the situation which a patient was often brought into by a wounded scalp.

A modern surgeon is very careful of the scalp, and knows, by much experience, that there arise, often from the slightest wound, the greatest dangers. Though the scalp be lacerated and thrown back, and even though the skull be cut up along with the scalp, he cleans it of blood, lays it down smoothly, and expects it to adhere. Though, in a narrow wound, he puts in his finger, and feels the cranium bare, though he puts in his probe, and knows that the skull is naked to a great extent, still he lays down the scalp carefully, and presses it gently, that it may adhere. If, in a young man or boy, there be a clean cut, he is sure that it will adhere ; if the scalp be wounded by a fall, or by a brick, stone, poker, or any weapon which at once cuts and bruises, he is doubtful whether it will adhere ; in a wound made with a club, or bludgeon, or in a gun-shot wound, he knows that there is a destruction of parts and loss of substance, and he knows that there can be no immediate adhesion in such a wound ;—yet he does not entirely despair, but preserves the scalp, hoping, in the end,

and after suppuration is well established, to put down the scalp, and keep the bone sound.

There are, no doubt, disappointments also in this safer practice, of putting down the scalp ; but although the scalp do not adhere on the first or second day, although the head inflame, and the scalp swell with erysipelas, so as absolutely to inflate the whole face, and close the eyes, the surgeon is but little alarmed ; he knows that this kind of swelling really belongs to the scalp, and betokens nothing wrong within ; he very composedly cuts out his stitches, lets the swelling subside, then lays the scalp down again, and thus after some accidents and interruptions, after swellings, suppurations, slight fever, burstings of the stitches, he, by a prudent perseverance, makes good his point ; reuniting in the end a sound flap to a healthy bone. Thence it is plain, that there is no wound absolutely safe : the slightest wound of the scalp may occasion danger ; but it is only when it does not adhere, that there is real danger ; the moment that it adheres all is safe.

You will now understand, that by SECONDARY AFFECTIONS OF the BRAIN, I mean all those which arise not from any immediate oppression, which do not appear at the time of the wound or blow, which make their slow insidious progress in the form of disease ; in which the scalp or periosteum of the skull is first injured, which injury is followed, after a deceitful interval, with this secondary affection of the brain ;—slow inflammation is the cause of all the mischief, and we must not wonder at its slowness ; for the skull is as a wall betwixt the external and internal parts, and it is only after corrupting the skull, that inflammation of the scalp can affect the brain ; and if it be true of a clean cut, it is much more true, that after a blow with a club, or any heavy body, there often lurks under the slightest wound the most imminent danger.

A man, who is knocked down with a club, becomes sick, faint, revives very slowly, but at last recovers almost perfect health ; he is able to go about, and feels as if in perfect health, or, if indisposed, it is in so slight a way that he hardly knows what ails him, nor even apprehends the smallest danger ;—but, after this

interval of deceitful ease, lasting sometimes for weeks he again becomes, as at first, sick and faint ; his knees bend under him, his hands tremble ; when he puts out his tongue, it trembles, as in a nervous fever ; there is a continual loathing of food, and he vomits at times. Then comes on an evening fever, a furred tongue, a quick and fretful pulse, flushings of the face ; the eyes are red and turgid ; there is a corded feeling, with weight and pain of the head, wildness or timidity in the aspect, and occasional delirium during the night, which imports the greatest danger. Now, there exists, in fact, a secondary inflammation of the brain ; sometimes, there comes on a dreadful delirium, and the patient can hardly be kept in bed ; he struggles with maniacal strength, foams at the mouth, sweats with the violent struggling, till, being quite exhausted, he sinks into paralysis or stupor, and then dies. But more frequently it happens, that, instead of this high and raging delirium, he is gradually more and more oppressed, so that, still even in this last stage, it is a slow, insidious disease, and in place of this delirious state, the sickness increases with lowness and languor ; he has a low delirium, and is not easily roused ; if allowed to lie, he is sunk in this stupor, if roused, he is slightly delirious, and raves ; while he is sinking again, it is with a low and muttering delirium ; and, after continuing many days in this condition, he falls into paralysis, is sometimes convulsed, voids his feces and urine insensibly, and dies.

The trepan is, in this case, almost a hopeless operation, and yet it is to be tried ; for these are the signs, though uncertain ones, of matter collecting upon the brain. The shiverings and quickness of pulse are the signs of matter forming ; the slight vomitings, delirium, and palsy, are the signs of its oppressing the brain : It is plainly an abscess of the brain ; and as it is an abscess which cannot burst nor relieve itself, though the trepan may fail to relieve the patient, yet, without that help, he is infallibly dead. No man need be ashamed to have believed, that there was matter, or to have trepanned on account of it, when there was none ; for what part is there in the body where the surgeon has not made his openings in search of matter, and has been deceived ?—Ox.

why should we be ashamed, when we are deceived by symptoms so irregular, and so alarming too, as those of a disordered brain?

But of all the symptoms which mark this disorder of the brain, the nature of that tumor, which arises over the diseased part, is the most absolute and decisive sign: For when the scalp only is concerned, the inflammation and tumor are of the erysipelatous kind; when there is blood poured out from any artery of the scalp, it makes a soft and fluctuating tumor; but when there is a diseased skull, or dura mater, the tumor is small, soft, puffy, regularly circumscribed, and seated immediately above the diseased part of the skull;—and its proceeding from the skull explains to us, abundantly well, why it is small, circumscribed, and puffy; for we find, that this puffy tumor is the peculiar mark of a diseased bone; and its being circumscribed and circular, is a natural consequence of the tumor being limited to that part of the skull which is hurt. Whether it be originally from a disease of the scalp, or from an internal affection of the dura mater, still this puffy tumor is a mark of danger; and when we open such a tumor, we find the pericranium thickened and raised; a thin sanies is collected betwixt the dura mater and skull; the skull itself is rough and bare, inclined to yellow, or sometimes of a dark colour, quite different from that of the surrounding parts, where the membrane is firm and sound; sometimes a small fissure assures us more absolutely of the danger within, yet, without this mark, we know, by much experience, that wherever the pericranium is thus inflamed and suppurated, the dura mater is seldom sound.

This is the second example of that sympathy betwixt external and internal parts, which I have described with so much care, only because it should be much observed. This is the lurking danger which keeps a man so long, for many weeks, or even months, in a lingering and sickly condition, and proves fatal in the end: This is the puffy tumor which Mr. Pott, and all modern surgeons, have so much noticed; this is the kind of danger, which makes Paræus declare, that there is no safety for the patient till a hun-



dred days have expired \*. It has been well marked, even from the time of Hippocrates, (who first noticed this kind of danger), down to this present day. It is through our apprehension of this kind of danger, that, while we do not despair in the most terrible wounds of the skull, we never disregard even the most trivial wound. A bruised blow with a club, the wound of a stone, hitting the head against the door, even the slightest injury may bring on this most dreadful disease.

It is this, expressly, which makes gun-shot wounds of the head so much more dangerous than common wounds. Indeed, it is easy to conceive how the oblique touch of a ball, though it seems to graze but slightly, will cause this mischief. We know, that the bruising of the inward parts against the skull is exactly equivalent to the bruising of the outward parts, hurting the pericranium ;—and how the pericranium will corrupt the skull, and the skull the dura mater ; and how in the end, after slow and very gradual symptoms, the dura mater will draw the brain into disease, it is very easy to conceive.

One soldier, for example, shall have his temple grazed with a ball, shall hardly know that he is hurt, or be sensible, for some time, that he is indisposed ;—shall walk about for six weeks, apparently in perfect health ; and then, all at once, shall droop, and fall low, become sick, and weak ; shall, at last, fall into coma, or awaken into the most dreadful struggling delirium, and then expire : And it shall be found, that the pericranium is separated from the skull, the skull itself black, and the dura mater inflamed, and oppressed with pus : While, on the other hand, another soldier in the same battle, shall be so wounded with a sabre, that the scalp, skull, and all, shall be cut clean away with a wound even of the brain itself, and yet the patient escape ; or, which is more singular, a soldier, wounded with a musket-ball, which is left sticking in the skull, with much depression and many frac-

\* Toutesfois tu noteras, que les anciens ont escrit, (ce qu'on void souvent par experience que les fractures du crâne ne sont hors du peril, jusque à cent jours apres la blessure ; faite partout say

tures of the bone, shall come to the hospital, walking alone ; shall suffer the extraction of the ball, and all the incisions and pickings of bone, which such a case require ; and shall eat and drink heartily, sleep soundly, and suffer not one bad symptom during his tedious cure. All this looks as if confined matter, and a lurking disease were more dangerous than the worst open fracture, and makes us watchful of such symptoms ; and, indeed, it often distinguishes the experienced surgeon, that he foresees the greatest danger, where, to the ignorant friends, there seems to be least cause for alarm. The contrast of two such cases, though seen but once in our lives (yet we have, but too often, occasion to see them contrasted thus), would almost persuade us to be of opinion with Le Dran and others, who seem to believe, that the more fracture there is, the better ; that the yielding and fracture of the cranium saves the brain from concussion.

But it belongs to the present occasion, to observe rather the insidious and dangerous nature of this slow disease, than the wonderful recoveries after broad fractures of the skull. Wherever this puffy tumor arises, and the bad symptoms ensue, we are to use the trepan ; and, sometimes, before we have cut half through the skull, foul matter begins to issue through the trepan hole ; or sometimes, matter, being collected under the dura mater, makes that membrane very tense, and oppresses the brain, so that we find it necessary to open that membrane also. The patient is generally, for the time, relieved, but, often, he is again oppressed, and sinks, and dies ;—or, if he lives, great fungi, sooner or later, shoot up through the opening ; and, by these, as well as by blood or matter, he is, at last, oppressed, and dies commonly in convulsions. In short, such are the dangers of exposing the brain, that I begin to incline to this opinion, that, though it is absolutely our duty to make one opening for the evacuation of matter, yet, if that one be free, it is unnecessary to multiply the openings ; for the danger, on one hand, viz. by oppression and inflammation of

avec ton patient bon guet, tant en son boire, manger, repos, coit, et autres choses. Page 220.

the brain, is just proportioned to the delay in opening the head ; and, on the other hand, the danger after the operation is exactly proportioned to the number of holes.

Upon the whole of this matter, my notion is, that a man, who is not saving of the skull, is little better skilled in the principles of surgery than Godifredus, chief surgeon to the States of Holland, who boasted of a friend of his, Henry Chadborn by name, also a surgeon in Holland, who had trepanned the head of Philip Count of Nassau twenty-seven times ; which Henry Chadborn had been so far from being insensible of this honour, that he got it settled by the following good certificate, under the prince's own hand :—*Ego, infra scriptus, attestor me, ab HENRIO CHADEORN, CHIRURGO NEOMAGNESI, postquam vigesies septies mihi caput perforasset recte fuisse sanatum. DATUM WEICHEMI, 12mo, Augustii, anni 1664.*—

And as for the surgeon who does not spare the scalp, or rather, who does not labour to save it, as the main point of his practice, he is little better skilled in his profession than the barber mentioned by Wiseman, who seems to have had a most Indian-like fashion, whenever he was called to a broken head (as barbers often were in those days), of cutting off the scalp, and hanging it up as a trophy, in his shop ; that those who came only to be shaved, or bled, might know how great a surgeon he was\*.

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#### OF IMMEDIATE AFFECTIONS OF THE BRAIN.

These affections of the brain, which I have just explained, are secondary ; only this delirium proceeding from high inflammation, or this oppression and palsy proceeding from matter generated beneath the skull are indeed very frequent ; but yet the im-

\* A young fellow, a servant to a horse courser, was thrown off his horse against some of the bars in Smithfield, whereby the calvaria, or hairy scalp, was torn up from the coronal suture to the temporal muscle on the left side : The skull was bared between two and three inches in breadth ; he was led to the next barber, who cut the piece off, and hanged it up in his shop. Wiseman, page 121.

mediate injuries of the brain claim still more of the surgeon's attention. In respect to these immediate injuries of the head, you cannot acquire a mature and steady judgment but by reading, and reflection, and much experience ; if you observe these injuries only in detail, you will find the varieties infinite, and will see nothing but inextricable confusion ; if you learn to class and arrange the facts, you will find that the kinds of injury to the brain are really few and simple, that there is indeed one only, with which, as surgeons, you have any concern, or which your operations will relieve, that is COMPRESSION OF THE BRAIN.

To believe that a fractured skull is a chief cause, or even an absolute sign of danger, is a very mistaken and vulgar notion ; it is not the damage done to the skull, but the injury to the brain, that is the cause of danger, and the fracture of the skull is but a faint, uncertain mark of the harm done to the brain. The varied appearance, after injuries seemingly alike in all points, is very perplexing ; but this we often have occasion to observe, that no particular injury, no harm to one point only of the brain, is fatal ; that the fatal injury is always either that universal shock which we call CONCUSSION, or that general pressure which we call COMPRESSION of the BRAIN ; except these two kinds of injuries, we know of none that is absolutely fatal ; and perhaps we may, with all safety, affirm, that there is, after all, but one kind of injury, strictly speaking, viz. CONCUSSION of the BRAIN, that is fatal ; for the brain itself may be wounded with weapons driven into its substance, may be cut and torn by fractured bones, may be wasted with great ulcers and tedious suppurations, or by collections of water the brain may be almost annihilated, without any remarkable affection either of the living principle, or of the rational powers. I have seen people survive prodigious effusions of blood for many days, their judgment being very little affected ; and men lying under suppuration of the brain for many weeks, and dying very easily and slowly ; I have very often seen the remains of most unequivocal depressions of the skull (*e. g.*) from the kick of a horse in boys who have grown up (the depression still continuing) till they became strong and healthy men. Since then no

property of the living system is hurt, none of the senses disturbed, none of the functions interrupted, since the man not only lives under this load of injury, but absolutely is restored to perfect health and strength, after a loss of the substance of the brain itself, we perceive clearly that no partial affection of the brain is fatal.

But *concussion* is an affection of the whole nervous system, indefinite and inscrutable, which is often fatal : we cannot conceive its nature before death, we cannot find by dissection what is wrong, we cannot prevent its consequences. It is some inconceivable derangement of the brain which sometimes follows a blow, even of the slightest kind, or which is produced, as its name implies, by a shock without a blow. A man falls from a great height, is not merely stunned by the fall, but lies oppressed, as if apoplectic, passing his fæces involuntarily, his pupil is dilated, his pulse slow and intermitting, his breathing laborious, sonorous, and also slow, his limbs cold, sometimes paralytic, sometimes convulsed, and thus he dies ; no injury can be discovered externally while he was alive, and when he is dead no injury can be found within ; the brain is found, the membranes firm, no blood, nor matter, nor displaced bone oppresses the brain ; he dies of a kind of injury concerning the nature of which we choose to express our ignorance, by calling it a *CONCUSSION* of the *BRAIN*. Since there is no visible derangement, we must continue, until we learn more concerning its nature, to consider it as some immediate disorganization or derangement of the whole brain, and we call it *concussion*, because it arises not from any particular injury, but from the general shock ; it is more readily produced by falls, than by blows ; it follows a fall upon the breech, as well as a fall upon the head ; it has ensued after a fall, even upon so yielding a fluid as water ; it proceeds from the general shock and derangement, but its particular nature is unknown ; only this much we do know concerning its ultimate effect, that it produces a general weakness of the whole body, and the cold extremities, dilated pupil, laborious breathing, and intermitting pulse, are the signs of this weakness ; and stimulants are well known to be the only cure. Bromefield began to use his sudorifics with advantage, without know-



ing what it meant, while it was really owing to the opium which they contained : wine was next used ; blistering on the head was next used ; and at last hartshorn itself was used with good effect. In short, that fact was discovered only by slow experience, which might have been understood from the most direct analogy, viz. that concussion is a state of weakness ; for when a man is knocked down with the fist, for example, he groans, is oppressed, vomits, is deadly pale and cold, he is as in a faint ; when he awakes, he staggers, has confusion of head, headach, and sickness of heart, and he is best recovered by hartshorn or wine. Now, had this state continued, it would have proved fatal ; had it been so, we should have said it was of concussion that he had died ; the species is not changed by the degree of the affection : we know this concussion, whether temporary or permanent, whether slight or fatal, to be merely a state of weakness ; and we have fair warning to forsake the old plan of profuse bleedings in all injuries of the head ; we know that there can be no dangerous injury to the head, without some degree of concussion of the brain, and, therefore, in every oppressed patient we give opium and wine.

COMPRESSION is like concussion, an affection of the whole brain, and in so far as we know it by symptoms, it is entirely the same ; for a lethargic stupor, sonorous breathing, oppressed and slow pulse, and dilated pupil, are the chief signs of it. Compression, most probably, produces a degree of that disorder or derangement by which concussion is fatal ; and one might say, without a violent figure, that compression were like a continued blow ; that, had the blow been withdrawn the moment the man fell, he would have revived immediately ; but by the bone being depressed, or blood being poured out under the skull, the blow is, as it were, continued ; and, when after some days the bone is raised up, the man begins instantly to revive and move.

Then these several kinds of injury may be contrasted thus with each other : a partial injury to the brain, even although it destroy the substance of the brain, though there be, as I have observed, a deep suppuration and wasting of the medullary substance of the brain, is not absolutely fatal ; the man lives and is very

little affected, and sometimes he recovers. Secondly, A general injury of the brain by shock or concussion is fatal ; it is a kind of injury, the nature of which we can neither understand before death, nor discover by dissection, and which our operations cannot cure. Thirdly, A general injury by oppression or compression of the brain, is most probably like, in its nature, to a general concussion, differing from it only in degree, the one being a permanent incurable derangement, the other a temporary derangement of organization easily removed. There is sometimes a CONCUSSION temporary and slight, as after a blow with the fist, which soon vanishes ; sometimes a more dangerous one, as by a fall from some great height, which is permanent and fatal. And, in like manner, there is sometimes a slighter derangement from COMPRESSION which we can relieve by raising the bone, or giving vent to matter or blood ; and sometimes a permanent derangement, or perhaps, as some will say, a degree of concussion along with the compression, which our operations cannot relieve. Thus it would appear that no partial injury is necessarily fatal,—that concussion, or this unknown internal derangement of the brain, is, if it goes a certain length, irremediable and absolutely fatal,—that compression, which is like concussion, is also often fatal ; while suppurations wasting even the substance of the brain hardly affect the vital or the mental powers, a patient living with an abscess deep in the very substance of the brain : and what is very curious, this internal suppuration produces its worst effects, when the matter begins to be confined and to oppress the whole brain, so that even in this case it is not so much the destruction of a part, as the oppression of the whole, that is a cause of danger.

If there be an injury of the scalp, a hurt of the skull, an internal separation of the dura mater, or any injury, which endangers inflammation of the brain, and if, along with that kind of danger, there be actually symptoms which mark inflammation of the brain, we try to prevent or moderate the inflammation by bleedings. If there be a concussion, and that the patient lies oppressed, vomiting, with difficult breathing and a slow pulse, we use opium,

wine, and all forms of stimulants. If there be, along with this oppression, external marks of injury, after an accident, such as might cause extravasation of blood or depression of the skull, in such case our duty is, first, to open the scalp so as to examine the skull, and next, to trepan the skull, if it be not found, with the hopes of relieving the brain.

Thus you perceive, that no injury requires operation, except compression of the brain, which may arise either from extravasated blood, or from depressed bone, or matter generated within the skull.

\* The vascular system within the skull is so very profuse, that

\* The vascular system within the skull, is what the surgeon is less curious about ; for if it is burst, or otherwise hurt, there is no helping of it ; but the vascular system without the skull, he is more interested in knowing well ; and accordingly we have many directions about the way of managing the frontal and temporal arteries, but none, so far as I remember, so curious as that which I shall now quote. " In wounds of the forehead, hæmorrhages are troublesome, on account of the bleeding arteries running in a groove of the bone." This is an old foolish story, bandied about from hand to hand ; it is in every book, old and new, so far the thing is excusable ; but the following operation, as described in the next paragraph, is not to be passed over.

" When the hæmorrhage continues so profuse as to endanger the patient, it may be proper even to remove that portion of the skull in which the vessel is incased ; or, in the hands of a NICE OPERATOR, the intention may be answered by taking away only the outer table of the skull ; for, in some cases, these arteries run for a considerable space between the two lamina of the bone, and in such instances our object must be accomplished by the removal of one of them." Vide Benjamin Bell's System of Surgery, vol. v. p. 169. I declare that I know nothing about the artery " running for a considerable space between the two lamina of the bone." Monro, I dare say, knows nothing about it ; and this is at least one new operation, which Mr. Bell has a fair title to, and which I am sure he never stole from Dr. Monro. Has Mr. Bell ever seen a skull ? or read of a skull ? or heard of a skull ? or can he point out any drawing of a skull, among all the books of the anatomists ? with an artery sunk into the frontal bone ? Until Mr. Bell satisfy me, in some way or other, about this artery, I shall hold this as one of the curious examples of the art of writing a system of surgery by conjectures and mere guesses. And even when Mr. Bell has found out the skull that he wants, I shall still take the privilege of saying, that if any young man were, on his authority, to apply the trepan for such a reason, he would probably kill his patient.

extravafations are very frequent, both on the furface and in the cavities of the brain. Sometimes the veins of the choroid plexus burft, and then the ventricles are filled with blood, but this is lefs frequent after falls or blows than in difeafes ; fometimes the fmaller finufes or veins about the bafis of the brain are torn, efpecially in counter-fiffures, filling the skull down to the occipital hole, and fometimes defcending into the canal of the fpine ; fometimes the blood burfts from the delicate veins of the pia mater, and then the furface of the brain is covered with blood ; and very often the artery of the dura mater is burft or torn, fo as to opprefs the brain with blood ; when this happens, the cafe is ftrictly an aneurifm of the brain, and as in aneurifms or burftings of the internal mammary or intercoftal arteries, the heart and lungs are oppreffed ; this aneurifm of the artery of the dura mater oppreffes the brain. This is the moft frequent accident of all, becaufe the artery of the dura mater is moft expofed to be pricked or lacerated, in fractures of the skull ; it is in a manner incafed within the bone ; but it is the leaft dangerous, becaufe the moment we trepan the skull we give vent to the blood.

There is ftill but one motive for applying the trepan, viz. to relieve the brain from compreffion ; whether that be from blood, matter, or depreffed bone. If there be blood, it is to be known only by guefs, by having opened the fcalp at the place of the blow, in the expectation of finding a fracture of the skull ; and by next trepanning the skull, in hopes of finding blood lying upon the furface of the brain. But if ftill after opening the skull the patient fhould lie comatofe and oppreffed, it being plain that he muft die if not relieved ; and if, alfo, from the tenfion of the dura mater, we fufpect that there is blood under that membrane, we muft venture to open it alfo, in hopes of relieving the brain. If matter, lying upon the furface of the dura mater, be the caufe of the compreffion, it will be known by the previous fymptoms ; by quicknefs of the pulse, headach, flufhed face, turgid eyes, corded feeling in the head, and all the other figns marking an inflammation of the brain. And if, after all thefe fymptoms, fhivering, lan-

guors, faintings, flight vomitings, and delirium come on, we are sure of the case. If there be found a fissure of the skull, that fissure is not itself the cause of danger, but it is the mark of that degree of injury, which may have produced extravasation; it also marks the place of the violence, and points out where we should apply the trepan. A fissure is not of itself a motive for trepanning the skull; but if with the fissure the patient lies oppressed, then the oppression is the mark of danger, perhaps, from extravasated blood; and the fracture, or fissure of the skull, marks the point on which we should apply our trepan. When the bones are directly pressed down by the blow, our way of proceeding is very plain; if the bones be moveable, we raise them gently up; if they seem totally disengaged, we pick them away; if the bones be locked in one with another, and pressed under the sound skull, we cut out one angle with the trepan, and that enables us to raise the depressed bone.

In all this operation we should be gentle, and rather reserved; for when blood has covered the whole skull from the sagittal suture quite to the petrous bone, it has all been evacuated by one single opening, and the patient saved. When there has been pus generated in great quantity, and much of the dura mater detached, one single perforation has been sufficient. When pieces of the skull have been apparently so detached from their membranes, that they have seemed irretrievably lost, they have, notwithstanding, lived and healed, especially in young patients; and often, when the depression has seemed so great, that the surgeon has neglected to raise it, or has been so difficult to raise that he has forsaken it, the patient has lived notwithstanding the great oppression, and been restored to perfect health.

Thus, once more I recommend to you to be gentle and modest, at the same time that you are daring; and I venture to say, that no man, who knows of these things, will insist upon raising, with unrelenting accuracy, and to the express level of the skull, every depressed piece of bone, unless he were indeed a surgeon so very careful, "that in a wounded intestine, he would not leave even the smallest opening, that could admit either chyle or fæces"



to pass, without stitching it up." But this is a kind of surgery which I have no good opinion of ; you are not to use the trepan, unless when you have some direct and plain motive ; there is enough of surgery, and of operations of all kinds, without such imprudence ; imprudence of this kind is quite unbecoming in a man who has grown old in surgery ; but in one who pretends to teach the science to others, it is dangerous in the extreme. Therefore, having laid down these few positive directions, I shall now mention one negative rule ; and I shall explain it to you very roundly, viz. that you are not to hearken to those writers, who are so hardened in surgery, or so childishly fond of operations, as to trepan the skull as willingly without any reason or apology, as when the motives are direct and clear. How much must a young man be surpris'd at being told, first of all, that the operation of trepan is in itself, indeed, and independent of the accidents which have required it, a very dangerous one ; but that, notwithstanding this, it must be often performed, when we neither know what ails the patient, nor in what part of the head his distress lies : that when the patient lies stupid and oppress'd, though we do not know whether it arises from compression, or from the shock merely, or whether it arises from the depression of the cranium, or from the effusion of blood, we are still to trepan ;—how much must a young man be shocked with the cruelty and absurdity of surgery, when he is told first, that, when there is no tumor, nor any other outward mark of injury, he must examine round all the head, thumbing and squeezing it, and the moment that the patient seems to shrink, there to cut into the skull ; next, that when he finds the outward surface of the skull sound, he is to presume, that the *inner table* of it is broken, and to apply the trepan ; next, finding the inner table also entire, he is to cut through the *dura mater*, looking for blood, or something under that membrane ; and lastly, having found his perforation at one point of the head ineffectual, he is to repeat his perforations all round, on various parts of the skull. This is the express rule which a modern author gives to " young practitioners." And every want of motive, and every appearance of want of success, is to push us

deeper and deeper in this desperate operation. What must a young man think of the science which he has set himself to learn? What must be the feelings of any old or sensible man of our profession, when he is told, that this single piece of surgery is diffused over fifty pages, is blazoned and enforced with the most violent assertions, and is exhibited as one of the most meritorious improvements in modern surgery. But lest my motives, for the wholesome criticisms which I am now going to make, should not be very manifest, I shall quote the text; and, having done so, I may then almost leave you to judge for yourselves. “But when no tumor, inflammation, or any other mark of injury, is discovered, we may, on some occasions, be directed to the seat of the accident, by pressing firmly over the whole head; and if we find, upon repeated trials, that pressure produces more pain in one particular part than in others, a circumstance of which we may be convinced, if the patient moans much upon pressure being applied to it; and if he puts up his hand, or draws away his head, on this trial being repeated, we may conclude, with much probability, that this is the seat of the injury \*.” “When, therefore, the symptoms of a compressed brain are evidently marked, we ought, without hesitation, to proceed to examine the state of the cranium, wherever appearances clearly point out, or even where they lead us only to conjecture where a fracture is.”

“We do this by laying the bone bare, by making an incision with a scalpel through all the external coverings of the skull \*.” Upon the teguments being divided, if the skull is found to be fractured and depressed, the nature of the case is thus rendered clear and obvious; and the means which we shall afterwards point out, for the treatment of fractures, attended with depression, should be immediately employed. “But, even in cases where no outward appearance of a fracture is met with, and where no tumor, discolouration, or other external mark of injury is discovered, if the patient continues to labour under symptoms of a compressed brain; if the pericrauium has been separated from the

\* Vide Benjamin Bell's System of Surgery, vol. iii. page 39.

bone ; and especially if this last has lost its natural appearance, and has acquired a pale, white, or dusky yellow hue, the trepan ought to be applied, without hesitation, at the place where these appearances mark the existence of some injury \*.”—“ Again, although no mark, either of fracture or of any disease underneath, should appear on the external table of the bone newly laid bare, yet there is a possibility, that the internal table may be fractured and depressed. This, indeed, is not a common occurrence, but various instances of it are recorded by authors : I have met with it in different cases ; and other practitioners, on whose accounts I can place the most perfect confidence, likewise mention it. †.”

“ In ordinary practice, if no benefit is reaped from the application of the trepan, if there is no fracture discovered of the internal table of the skull, or no extravasation on that part of the brain, newly denuded by a removal of a piece of bone, and if blood-letting, laxatives, and the other means usually employed, do not remove the symptoms of compression, it is generally concluded, that they depend, either upon a concussion of the brain, or upon extravasation in some of the internal parts of it, where the effects of an operation cannot reach ; and accordingly the patient is left to his fate, without any attempt being made for his relief ‡.”

“ In whatever part of the head the patient complains, on pressure being applied to it, the skull should be laid bare by an incision, in the manner we have mentioned. If both tables of the skull are fractured and depressed, the cause of all the mischief will thus be discovered ; but, even although no such depression or fracture should be met with in the external lamella of the bone, as there is at least some chance of mischief being met with underneath, either from a fracture of the internal table, or from extravasation ; and as nothing can save the patient but a removal of this, the trepan ought to be immediately applied ; and wherever there is the least reason to suspect, either from pain being induced from

\* Ibid. vol. iii. page 44.

† Ibid. vol. iii. page 45.

‡ Ibid. vol. iii. page 48

pressure applied in the manner we have directed, or from any other circumstance, that mischief may be concealed : as long as relief has not been obtained by what was previously done, the operation ought still to be repeated, as being the only means from whence any advantage can be derived \*.”

“ But it often happens, that no external mark is to be met with to lead to the seat of the injury ; even after the whole head is shaved, and examined with most minute attention, the skin will, in various instances, be found perfectly sound, without any appearance either of tumor or discolouration. A patient, in such circumstances, we suppose to be in great hazard, from the brain being compressed in one part or another : Unless this compression be removed by an operation, he must in all probability die ; in what manner, then, is a practitioner to conduct himself ? The situation is distressing ; but still, in my opinion, there should be no hesitation as to the line of conduct a surgeon ought to pursue, which should be quite the reverse of what is almost UNIVERSALLY ADOPTED.”

“ It has hitherto been held as an established maxim never to apply the trepan, in compression of the brain from external violence, where no external mark occurs to point out the seat of the injury † ;” “ we shall suppose, therefore, for the reasons now mentioned, that the trepan is to be applied on the account of symptoms which accompany a compressed state of the brain ; but where no external mark indicates the particular seat of the injury, it may be asked in what manner is an operator to proceed ? As the cause producing the compression may exist as readily in one part of the brain as in another, it may seem to be a matter of little importance in what part of the head the first perforation is made. This, however, is far from being the case ; for, as we are supposing the compression to be induced by blood or serum, and as these, while in a fluid state, are always passing as much towards the basis of the brain, as the connection between the dura mater and the internal surface of the skull will allow ; it will be proper to form

\* Ibid. vol. iii. page 50.

† Ibid. vol. iii. page 117.

the first perforation in the MOST INFERIOR PART of the cranium in which it can with any propriety be made, and TO PROCEED TO PERFORATE EVERY ACCESSIBLE PART OF THE SKULL, till the cause of the compression is DISCOVERED\*.” “ But, as the safety of those intrusted to us ought to be our first and great object, and professional fame only a secondary consideration, whenever we are certain that death must ensue, if not prevented by the timely application of a proper remedy, although there may be very little certainty of this remedy proving successful ; yet if it is the only means from whence there is any chance of safety, it ought undoubtedly to be employed. It is on this principle solely, that I have advised the practice of perforating the skull in different places, when, in cases of compressed brain, the part chiefly affected is not pointed out by some external mark of injury†.”

Any man may sometimes be seduced, so far as to do incautious things in the heat and bustle of an operation ; but to write all this in cold blood is quite beyond the common. I might, indeed, very safely leave this to your own good sense ; but I must, in a few words, entreat you to consider whither this practice would lead you. A boy is struck by another with a stone, lies for many days bleeding at the nose, comatose, vomiting, and with every bad symptom ; his surgeons are all the while advising the operation, his friends are pleading for a respite, when the boy begins gradually to recover, and is in a few days perfectly restored. I have seen a prudent physician resist with great perseverance, while a bold surgeon on the other hand, was violently bent on the operation, and the boy in a few days recover. I have known a gentleman, after falling from his horse, lie for many weeks oppressed, and in a profound coma, with continual vomitings, and bleedings from the ears so profuse as absolutely to endanger life, who yet recovered perfectly. Often, in the Hotel Dieu, where they dare not perform this operation, we hear of patients lying oppressed for many days, and weeks, and yet recovering in the end ; and in every hospital we occasionally see the same. Mr. Pott observes,

\* Ibid. vol. iii. page 121.

† Ibid. vol. iii. page 130.



“that symptoms of oppression are no good reason for cutting the integuments, and that loss of sense, the hæmorrhagy from the nose and ears are sometimes totally relieved by the common means\*.” Consider if, in any given case, the patient lying oppressed, and having no mark of injury outwardly, upon the head, you should advise the trepan, while a man who had studied more the common sense of surgery than the authorities of school books, should prevent this unmeaning operation; and if, in the meanwhile, the patient should be entirely relieved, what would become of you? Or, if you should be allowed to perform your operation, and should find nothing wrong, what consolation would that be? But if without any kind of motive you should continue your perforations quite round the skull, I dare assure you, that there is but one man alive who would stand forth to vindicate your conduct, and whether, after the experiment were made, he would have the boldness to do that, which, in all conscience and honesty, he ought to do, I do not know. This must be, no doubt, a precious lesson for young surgeons; the danger and folly of the thing is what must chiefly affect every serious person; but besides that, the following quotations must be very amusing to those who know how this matter really stands.

“Although (says Mr. Bell) the opinion I have thus ventured to give is not agreeable to general practice, yet as this practice has ancient custom only for its support, being, in every other ref-

\* Mr. Bell, of Albie, having drank too freely, was thrown from his horse as he was riding home; he lay for some time on the snow, cold and benumbed,—no wound nor bruise could be discovered, only there was a small swelling above the left eye, and that eyelid was paralytic. His friends thought him in a sound sleep; but in a few hours he awoke in a violent frenzy, furiously mad, beating every one that came near him, and biting those that held him, so that it required four men to keep him down in bed, and many more to hold him while the surgeon bled him. Mr. Hill, after relating the case, and how he recovered his senses suddenly, while walking in the fields on the twentieth day, adds this note: “Dr. Gilchrist and I went often to him with the design of applying the trepan; but as no particular symptom indicated where that could be done with advantage, we did not think proper to do it by guess.” Hill, p. 125. In this I am not sure but that they were pretty much in the right.

pest apparently ill founded, the advantages which may accrue from a different mode of treatment will only require to be thus fully pointed out, in order to procure it a favourable reception.” “Prejudice arising from, and supported by ancient authority, will here, as in most cases, have some effect in preventing a *new* proposal from meeting with much attention ; but I think it probable that no great length of time will be required to place it in a more favourable point of view \*.” It is a pity to see the author in such anxiety about this new proposal of his ; it seems to have quite bewildered his judgment, whenever he tried to guess about the fate of this important discovery ; in one moment he says, “it needs but to be thus *fully* pointed out to procure it favorable reception ;” he says with the same breath, “prejudice will prevent it.” If this maxim of operation with the trepan, only when some good motive for so doing can be shown, is now to be considered merely as an ancient custom, I must declare that it is an ancient custom with which I am well contented. If nothing but prejudice can account for a man refusing to trepan when he does not see any reason for so doing, I must rejoice that I am as full of prejudice as I could desire to be ; but, after all, though he abuses us in this manner, about our general practice, Mr. Bell has really no great share in this curious discovery ; for I believe it would be easy to convict some very old and respectable writers, and Heister among others, of the wicked and felonious intention of anticipating this *new proposal* of Mr. Bell’s. Heister’s words are these : “Sometimes it is impossible to discover the particular part of the cranium which is injured ; the patient, in the mean time, being afflicted with the most urgent and dangerous symptoms. In these cases it will be necessary to trepan first on the RIGHT side of the head, then on the LEFT side, afterwards upon the FOREHEAD, and lastly, upon the OCCIPUT, and so ALL ROUND until you meet with the seat of the disorder †.” Here, for the honour of the old surgery, is one man as free from prejudice as could be desired, and

\* P. 131. † Heister, p. 358.

from all other feelings that might trouble a surgeon. If I were to take any farther pains to refute an opinion, against which your sensibility, judgment, and every manly feeling must be roused, I should employ myself chiefly in explaining to you how absurd the intention were, and how melancholy the conclusion would be. As for the intention, it seems to me to be nothing more natural than merely this, that the surgeon is by all this boring at the skull "seeking," as a certain great author would have expressed himself, "something which lies somewhere \*." And as for the probable consequences, I am sure they are such, that we might with all safety class the operation under that division of wounds which is denominated by old authors *lethalitas per accidens*. For "Wounds, (says Heister †) become MORTAL by ACCIDENTS, either by the ill conduct of the patient himself, or by the ignorance or neglect of the surgeon." "The accused person ought to be acquitted, and the surgeon indicted."

\* The author I allude to is Mr. John Hunter, who, in a most curious account of a gentleman who had been shot in a duel, with a ball which passed across the abdomen, informs us most minutely, that, "among other symptoms, he had frequent vomiting, chiefly of bile, with small bits of *something* that was of some consistence." Hunter, p. 546.

† Heister, p. 31 and 32.

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## DISCOURSE VI.

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### ON WOUNDS OF THE THROAT.

IT is only by his general knowledge of the principles of surgery, and by his particular acquaintance with the parts about the throat, that a man can be prepared for the ugly accidents which overtake us so suddenly ; but yet, however necessary this kind of knowledge is, I must presume that it is rather what you have already acquired, than what I ought to teach you. I shall refrain from any other than the slightest remarks upon the relations of the several parts of the throat to each other, and shall state such, merely, as will assist you in acquiring correct notions of the accidents which commonly happen, and, what is of fully as much consequence, of the mistakes that are very commonly committed ; for I shall undertake to prove, that many among those who have written cases of this kind, have spoken very loosely, hardly understanding the parts which they pretended to describe.

The LARYNX is the cartilaginous part of that tube which conveys the air ;—and the connections of the larynx with the surrounding parts are these : The OS HYOIDES lies under the chin, in that great fold which we call, in fat people, the double chin. It lies, properly in the root of the tongue ; whence it is sometimes called the bone of the tongue ; it cannot easily be felt from without ; but, when we thrust the finger down into the throat, in the accident of a fish bone, or any foreign body sticking there, we feel the two slender horns of the os hyoides extending and holding open the pharynx or bag, by which we swallow ;—so that the os hyoides, which resembles the thought-bone of a fowl, has its base or angle lodged in the root of the tongue, and its two long horns extending along the sides of the pharynx.

The first piece of the larynx is the **THYROID CARTILAGE**, the great shield-like cartilage which protects all the others, which is easily felt, being the most prominent point of the throat. The outward projection of it where it makes its angle in the fore part of the throat, is called the **POMUM ADAMI** ; and within this cartilage, and under the protection of its broad wings, lies the **RIMA GLOTTIDIS**, or that delicate opening or chink, which forms the voice.

The **EPIGLOTTIS**, or valve, which lies over the glottis or chink, to defend it, is connected rather with the os hyoides, and root of the tongue, than with the larynx or cartilaginous part of the trachea.

Below this great thyroid cartilage, there is a circular or ring-like cartilage, joining the trachea or membranous part of the tube to the larynx or cartilaginous part ; and then the rings of the trachea, five or six in number, complete the tube, to the place at which the trachea goes down into the chest. It is upon the very point where the trachea is joined to the larynx that the **THYROID GLAND** lies.

Behind the trachea, which is rigid, lies the **OESOPHAGUS**, which is quite a flexible tube ; so that the **LARYNX** is the rigid part of that tube which is for receiving air, and the trachea is the continuation of the same tube ; while the **PHARYNX** is the large bag, being the beginning of that tube which is for receiving food, and the **œsophagus** is the continuation of the same tube. The larynx, then, is so formed as to modulate the voice ; the pharynx is so large a bag, as to be capable of receiving the largest morsel. The larynx can shut itself so accurately, as to prevent the smallest drop of fluid from entering into the trachea. The pharynx can dilate so freely, and can grasp so closely, as to receive the largest morsel easily, or swallow the smallest pill, or a drop of water.

Now, the chief point to be remembered, in regard to Wounds of the Throat, is the relation of the carotid arteries to the trachea and larynx ; the connection of the great veins and nerves, again, with the carotid artery, and the manner in which the first branch of the carotid artery goes off.—First, It is to be remem-



bered, that the arch of the aorta lies in the upper part of the chest before the trachea ; and that, where the carotid arteries come out from the chest, to go up along the neck, they are scarcely at the sides of the trachea, they rather run before it : But that, as the arteries mount up the neck, they incline more to the side of the trachea ; and that, at the upper end of the neck, the carotids are entirely behind the trachea ; for they incline towards the angle of the lower jaw, and, having reached it, they begin there to give off their branches, both those for the head and those for the neck. From this observation one thing very particular is explained,—how a wound at the lower part of the neck will very often be fatal, while a wound in the upper part of it is less dangerous. The suicide seldom strikes at the lower part of the neck ; and it is by this accident of striking very high and near to the chin that the carotids escape.

Next it is to be remembered, that the carotid artery, the great jugular vein, and the Par vagum, or eighth pair of nerves, lie connected with each other, very closely, being all enclosed in one mass of cellular substance, forming something like a sheath. Now, since this eighth pair is one of the greatest nerves of the viscera ; and since, by experiments upon animals, we know well, that a wound of it is more fatal than a wound of the brain itself, this puts an end, at once, to all questions about the way of managing wounds of the carotid artery, or of the great vein. No doubt, these may, sometimes, be partially wounded, and the nerve escape ; but, in general, the nerve will be cut along with them, and, at all events, the fear of including it will prevent our striking with a needle in the neck ;—we can only take up the carotid artery, when we see it bleeding with open mouth, and can pull it out with our finger and thumb ; and how near it is to an impossibility, that this should happen, and the patient live till the surgeon arrive, you may easily conceive.

This plain description of the connections of the trachea, œsophagus, carotid artery, vein, and nerves, explains to you how ignorantly those authors have written about Wounds of the Throat, who tell us, first, a formal story about the wound having passed

through both the trachea and œsophagus, and then, how the patient was cured ;—for it is impossible to cut across both trachea and œsophagus without wounding the carotid artery, the jugular vein, and the eighth pair of nerves ; you may guess, then, whether the wounds they described were exactly what they believed them to be.

The reason for saying, in such cases (so easily cured), that the wound had passed through both the trachea and the œsophagus, is very ignorant : it is merely this, that the surgeon sees both air and food come out by the wound ; and no one scruples to say, when he sees both air and food come out by the wound, that the trachea and œsophagus are both cut, while the fact is, that neither the œsophagus nor trachea are touched in the least degree, that the wound is much above them ; for a suicide always strikes immediately under the chin ; his wound, as far as I have observed, commonly falls in the line or furrow of the skin, which divides the neck from the chin :—That is the place where the os hyoides lies, and he commonly cuts the os hyoides away from its connection with the thyroid cartilage or pomum Adami. Now, in that case, the thyroid cartilage, forming the uppermost part of the larynx, is not touched ; the Rima Glottidis lies below the wound, quite safe ; the wound, indeed, separates the epiglottis from the glottis, but it leaves the glottis and the larynx quite safe ; it only separates the larynx from the root of the tongue ; it is properly a wound in the root of the tongue ; it is rather a wound of the mouth than of the throat ; and when the food comes out, along with spittle and froth, it is by rolling over the root of the tongue.

One thing more is to be remembered, that the first branch going off from the carotid artery, is the artery of the thyroid gland ; that it comes off from the main artery at the angle of the jaw, and turns downwards along the side of the throat, to plunge into its gland. Now, as this artery lies along the side of the trachea on its upper part,—and as its tendency is forwards, towards the fore part of the trachea, where the gland lies, it is much exposed, and is almost always cut ;—the bleeding from it is terribly profuse ; the patient faints ; and the surgeon naturally believes it to

be the carotid artery ; if the surgeon does not come early, its bleeding is as fatal as that of the carotid artery itself.

When a surgeon continues, during all the cure, to dress his patient daily, without knowing what parts are cut, or, in delivering the notes of such a case, misnames the parts ; he is guilty of such gross ignorance, that he should hardly be concealed. The following description I introduce, chiefly for the purpose of illustrating what I have just told you ;—it is extracted from a Medical Collection, and is entitled “The history of a remarkable wound of the trachea and neighbouring parts.”—“I found this man,” says the author, “lying upon the ground, with his throat cut from ear to ear,—and an immense effusion of blood.”

“The external jugular veins, on both sides, were perfectly divided,—the carotid artery laid bare,—the trachea arteria divided from the larynx, above the *pomum Adami*. The epiglottis and glottis entirely detached from the *Rima Glottidis* ;—the trachea cut through, except about a finger-breadth of the back-part, which was very much stretched ; for the trachea, which was thus divided, had retracted equal with the clavicles.”

This is a very singular instance of ignorance and confusion : The plain story is this, that the man, having cut his throat from ear to ear, had separated the *os hyoides*, which lies in the root of the tongue, from the thyroid cartilage, which forms the upper part of the larynx, and consequently the damage was plainly this ; the mouth was cut open rather than the throat, the tongue was cut away from the larynx, and the epiglottis was separated from the Glottis, *Rima*, or *Chink*, for this little opening has all these names.

To divide the trachea from the larynx, the cut must be under the thyroid cartilage, or *pomum Adami* ; but the author tells us, that “the trachea arteria was divided from the larynx, above the *pomum Adami*,” though the *pomum Adami* is itself the bulging of the larynx, and nothing is above it but the *os hyoides* and tongue ; and he tells us next, that “the glottis and epiglottis were detached from the *Rima Glottidis*,” as if the *Rima Glottidis* and the glottis were not actually the same. In short, the mistakes and

absurdities of this kind which are to be found in books, are endless, and there could neither be pleasure nor instruction in pursuing this subject any farther \*.

The chief difficulty lies in understanding the anatomy of the parts ; for, as a simple wound, you know that in this, as in any other, you have but two points to attend to, to suppress the bleeding, and to procure adhesion. And both these points you will understand much better, by remembering what I have just proved to you, viz. that very commonly the wound is high betwixt the throat and the tongue ; for this particular place of the wound makes it easy to prevent bleeding, but difficult to procure adhesion.

1st, The wound being very high, the carotid arteries are quite safe, for at the upper part of the neck they retire so, that they are really under the angle of the jaw ; and you will have observed, that in this very case, related by the surgeon, the throat was cut from ear to ear, and yet the carotids were safe ; and the carotids were exposed by the wound, only because the wound extended from ear to ear. It is not the carotids that are touched in the common attempts of suicides—it is sometimes from some of the lower branches of the lingual artery, but chiefly from the great thyroid arteries that the man bleeds. The person, who does this deed in secret, commonly faints and falls down. It is this fainting that saves his life. These arteries are large enough to cause

\* Mr. Benjamin Bell has made a curious conjecture concerning wounds of the œsophagus : He says, “ Wounds of the œsophagus are chiefly dangerous, on account of the difficulty of reaching it from its deep situation ; and from the under part of the œsophagus, when entirely separated from the rest, being apt to fall altogether within the sternum ; and from the difficulty of supporting the patient with proper nourishment,” p. 167. Now, Mr. Bell, when he was guessing about this, might as easily have guessed, (since the back part of the œsophagus lies smooth against the fore part of the vertebræ), that whenever the œsophagus was so fairly cut across, as to sink under the sternum, all the parts of the neck must be cut, and nothing in fact left, but the vertebræ for the head to nod upon ; in such a wound, viz. where the carotid arteries, jugular vein, and great nerve were all cut, I should conjecture, that the surgeon would not be long troubled about ways and means of SUPPORTING the patient with PROPER NOURISHMENT.

a fatal bleeding ; we are, therefore, careful not to rouse him from this languid state, till we are sure that we can command the blood. If, when we arrive, the arteries be still bleeding, we apply the point of our fingers, stop the arteries, draw them out with the tenaculum, or tie them with the needle, for in this upper part of the throat the needle may be safely used ; but often during the fainting, they are so retracted among the cellular substance, that we are saved all trouble and care, except that of making our outward stitches for uniting the lips of the wound.

2d, The REUNION of the WOUND is chiefly prevented by the continual flowing of the saliva, by the food rolling out this way, by the continual cough which the irritation of the now unprotected glottis occasions, by the continual motion in the endeavours to swallow, and especially by the tearing motions which take place whenever the tongue or the whole throat moves ; for the os hyoides, or bone of the tongue, is the very point to which all the muscles which move the throat or tongue are attached.

Our chief object should be, first, to get the parts into fair and neat contact, so that not a particle of food nor of foam should escape ; and next, to prevent, by all contrivances and every kind of care, the least degree of motion of the tongue, or parts about the throat. It is well known, that if parts do not unite early, it is not easy to make them unite at any after period ; and yet I cannot tell how often I have seen the throat left gaping, to a most enormous extent, the saliva continually besmearing the neck and breast, and the edges of the mouth-like wound as callous as the palm of the hand.

The effort to swallow cannot be entirely prevented, for the patient will, notwithstanding your remonstrances, continue to swallow the spittle, working continually with the throat ; but his swallowing of food should not be allowed. To nourish a man by glysters, during this tedious cure, is impossible ; you must, therefore, find some way of conveying food to the stomach, without any effort on his part, by an eel's skin, or by a flexible leather tube, such as we use for injecting tobacco smoke, introduced into the œsophagus.



The continual draining of the saliva cannot be prevented otherwise than by closing the wound neatly and effectually ; it should be closed with a number of separate stitches proportioned to the extent of the wound. The stitches should be neat and firm, through the skin and muscles,—through all the flesh that you can get fairly, but not through the cartilages. In the interstices of the stitches, you should lay neat slips of black court-plaster across the lips of the wound,—you should lay a large flat adhesive plaster over all, to make it firm,—you should bring the head forwards, and bridle down the chin to the waistcoat,—your patient should be ordered neither to speak nor to swallow ; and he should be enjoined rather to let the saliva trickle down the corners of his mouth, than to swallow it.

In the disordered condition of his mind, large opiates will help to compose him to rest, and may be useful in appeasing the irritation and cough ; and you must especially remember, that the presence of some friend is necessary both to soothe him, and to watch over him. Often, indeed, he falls into a humble and penitent state of mind, and bears every thing quietly ; but sometimes the shame of what he has attempted, and the apprehension of appearing again in the world, makes him weary of life, wishing that what is begun were completed ; so that sometimes I have been obliged to bind such unhappy people before they could be dressed, and never could think of leaving even the most composed of them without precautions.

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## DISCOURSE VII.

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### ON DANGEROUS WOUNDS OF THE LIMBS.

**I** NOW come to a subject the most difficult of all ; for it is not to be told merely how to dress a wounded limb, or to take up the arteries, or how to dilate the wound, or to extract the balls or the splinters of bone ; these are duties exceedingly easy and plain : But there is a question implied, which, from the earliest times of modern surgery, has been esteemed a question of high importance, viz. whether we should amputate in dangerous wounds of the limbs ; and yet all the surgeons of Europe, with the collected sense and experience of the whole, drawn as into a focus, and bearing upon this one point, have left it still undecided. Le Dran says, “ Wherever there plainly is a necessity for losing a limb, the sooner it is done the better.” While Mr. Belguer exclaims, “ To cut off a limb after a bad wound, what is it but to add wound to wound ? to heap new pains upon a disordered system ? what is it but plainly taking away the patient’s life \* ? ” The disputes in the French Academy upon this subject have been endless.

It is natural for me to tell you how unwillingly I undertake the task even of explaining these opinions to you, much more of directing your judgment.—But although I know well how impossible it is for any man to acquit himself to your perfect satisfaction, since doubts and fears will keep their hold upon your mind ; yet this is a matter which cannot be slightly passed over, since the question must return upon you daily in practice. In a

\* Mr. Belguer’s language is of a kind not to be translated literally on almost any occasion, and, least of all, when he is poetically inclined ; for his figures are never of the elegant cast.—His expression for this is :—“ Interrogo enim unumquemque ex medicis et chirurgis an non hoc esset hominem jugulare.”

wound of the breast, or of the belly, we can do but little for our patient's safety ; we cannot root out the disease ; there he must lie and take his fate, to die or to live. But when a limb is miserably torn by a ball, by machinery, by a loaded waggon passing over it, you are thrown into anxiety not to be expressed ; both through an honest fear of your patient's safety, and also from apprehensions, not unbecoming, concerning your own reputation. You may cut off the limb in the hopes of cutting off the disease ; or you may try to save the limb, at the risk of your patient's life ! But however wisely you may determine, full hardly shall you escape calumny ! whether you cut off the limb, or whether you try to save it, there is danger, there are authorities against you on either hand : and of those authorities one represents amputation as fatal ; another says, that wherever the limbs are severely shattered, the accident is mortal : if you hearken to the ill success of amputation, as represented by one party, you will think surely no man can be saved in this way ! and if you listen to the wonderful tales of others concerning recovery from shattered bones and lacerated limbs, you will be apt to exclaim, " How, after this cure, should any man be allowed to die," when really this cure, so much vaunted, is but one case picked out of ten thousand.

In a question like this, you will find it prudent to read but one book or none ; either to hold to the advice and practice of one surgeon, or wait till you see practice, and are brought to an individual case, and, unbiassed by doctrine, try to follow nature ; try to learn, by a little experience, by slow degrees, and with some hazards, and some vexations, how much she really can do for you ; what wounds are only dangerous, and what wounds are absolutely fatal.

Considering the great value of experience in steadyng your mind, I hold it fit, first of all, to represent to you the nature and consequences of fractured wounds, before I try to unravel the intricacies of the question before us.

Wounds of the limbs, like wounds of the bowels, are dangerous in proportion to the value of the parts wounded ; and this consideration reduces the subject to few points, the wounds of great

arteries, the wounds of bones, or the wounds of the large joints. But before I represent to you the particular dangers, I shall first relate the general treatment of any such dangerous wounds. The damage done to a limb by a cannon-ball, is much like that done by heavy machinery, or by a waggon-wheel passing over a limb, like those accidents which happen daily in factories or in mines; both the one and the other consists in a bruising and almost total destruction of the flesh, a laceration of the great arteries, and fracture, or rather crushing of the bones; so that many smaller pieces are splintered and separated, or sometimes a middle portion of the bone squeezed entirely out of the limb.—Even the lesser gun-shot wounds resemble these in their dangers; for, wherever a musket-ball tears the arteries, and breaks the bones, the danger is very great; and therefore, it is most natural for me to begin this subject by explaining to you the manner of treating those dangerous wounds, where, after all, I must seem to be employed rather in illustrating the dangers of such cases, than in advising a method of cure.

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#### OF DANGEROUS WOUNDS GOING DEEP AMONG THE FLESH.

If a musket-ball have made a flesh wound, attended with great swelling, you should dilate it; being especially careful to cut the fascia, as, for instance, in the thigh, and to divide the fibres of the muscles, not crossways, but lengthways. If the ball have made a deeper wound, and hurt the bones, if the tibia and fibula be broken, or the ball have passed through the foot or hand, you have much to do; you must dilate freely,—make so large an opening that you put your finger down into the wound, and get the splinters of bone away, or the ball, if it remains, or pieces of cloth, or boot or harness; and though sometimes balls will be closed up in the heart of bones, or pieces of bone will be reunited, though apparently too large to be restored, still you are not to trust to such chances, but must endeavour to get the ball away

with forceps, to cut the piece out with the trepan, to pull away the looser bones with your finger, to separate also those which are shaking, but yet connected. All this you may do without being too curious in your searches, and pieces of bone, very long and sharp-pointed, lie often in such a manner in the wound, that while they remain, the bad symptoms cannot cease.

When the first inflammation comes on, you may find it necessary to bleed ; but you will be inclined to do it with discretion, when you think of the long confinement and many dangers which your patient has to endure. When these first inflammations are over, your patient falls into that condition which I have formerly described : At first, a mild suppuration forms, by and by it becomes profuse, and soon after this profuse discharge, has a manifest effect upon his health ; there is a large gleetingsore, loose and carious bones, fever, diarrhœa, and a great declining of strength ; and after this change, the supporting your patient's strength is your chief business during all the cure.

When accessions of fever come on with a frequent pulse, heat, thirst, and a furred tongue, and a languishing and sickly feeling, which portend a more violent disorder, this is the approach of a fever not to be subdued by bleeding : It is the infection of a foul hospital or sickly camp ; it may be, perhaps, from the gleetingsore, or from the putrid smell of it ; and this fever is to be combated with bark and wine. You should give your patient a vomit in the morning, and an anodyne with a draught of warm wine at night ; and, indeed, in the cure of any wound by which a patient loses much blood, you should begin by giving him spirits and water, or wine ; next day, you order the bark in two, four, or six doses a day, according to the occasion, and should accompany it with laudanum, if it be likely to be thrown up, or with rhubarb and some aromatic powder, if a diarrhœa prevails. The patient is sometimes costive, and should have a dose of rhubarb and aromatic powder, or of magnesia and cinnamon given him ; and he is often sick, for which he should have a cordial provided of centaury gentian, and marmalade of oranges



infused in spirits of wine ; which, being mixed with peppermint and cinnamon waters, should be given a glass full two or three times a day.

Often there is a sudden attack of fever in the morning, and all is quiet at night ; often the fever takes a distinct shape, with a hot, cold, and sweating stage ; often it leaves merely a debility, shivering coldness, and sickly state ; too often the patient falls into the hospital fever, his wound mortifies, and he dies. All these changes are to be carefully watched, and are guarded against by emetics, and opiates, wine prudently given, and, above all, the fever should be met with large doses of bark, which you will administer in various forms, joining it sometimes with cordial infusion, sometimes with snake-root, or with fugar and some essential oil in the form of an electuary.—With these medicines you fight against the febrile attacks, and you strive to keep your patient in health, during his tedious cure, with generous diet and wine, careful attendance and cleanliness, and great care to keep his wounds from being neglected or foul.—During this lingering cure, you have, from time to time, new inflammations with great pain, new abscesses, increase of the discharge, a flabby wound, and alarms, and interruptions of every kind ; then loose pieces of bone presenting themselves, which you are obliged to work out with no little pain. And thus, after eight months or more of pain and suffering, your patient begins to move about a mere walking shadow.

This, I shall presently prove to you, is a true representation of the sufferings and escapes of those who recover from such wounds ; but first I shall notice some other cases. Often, let us do what we will, even this much cannot be obtained upon such easy terms ; the limb falls into gangrene, and the patient is for some days in the most imminent danger of sinking all at once ; the limb becomes livid and cold, small vesicles arise ; it loses all feeling, and becomes black and thoroughly mortified down to the bone. Then the surgeon begins his scarifications ; he scores the gangrened parts with incisions which go down through the dry crust of the gangrened skin, he carries his knife through the mass of bloody

and corrupted flesh, down till it touch the sound parts, or till it touch the bone ; he makes his incisions long in proportion to the gangrene, at an inch or more distant from each other, is careful to avoid the great arteries, or to tie them if they happen to be cut, applies poultices, and when they have softened the hard skin, scrapes away with his knives the putrid mass which covers the sound flesh, or which goes perhaps down to the bone. Now it is common to ply the wine, and to lay hot and stimulant dressings over the fores ; to make embrocations and turpentine dressings, which are applied upon rags dipped in the hot balsam ; and it is usual to lay some stimulant fomentation over all, wrapping the limb in cloths soaked in decoctions of chamomile sharpened and made stimulating with solution of sal ammoniac and nitre, or by the addition of vinegar or wine. Or to quicken and bring into suppuration the surrounding parts, spirituous fomentation with camphire or sal ammoniac are used ; or fomentations are made of wormwood, rue, chamomile, &c. with the addition of camphorated spirits.

These applications are meant to correct the fetor of the dead, and strengthen the action of the living parts ; and whenever the line of suppuration forms, and healthy pus begins to appear through the putrid sloughs, the stimulant medicines are left off, and the pus encouraged by the more natural application of an emollient poultice ; and the spoiled bones are taken away, or the exfoliating pieces killed thoroughly, and separated by boring with the trepan, or with the perforator. Above all, this rule must not be forgotten, that emollient fomentation, and the common poultice, are fitter for the smaller wounds of musket-balls, as in the fore arm, the leg, the joints, in flesh wounds, in short, in all those wounds which we dilate for the purpose of preventing tension, and which, therefore, are less apt to run into a broad or general gangrene. The spirituous fomentations are fitter for the bruises of great balls, or for the stumps of limbs shattered by the great balls ; and the balsams, turpentine, and other hot dressings, are best in open gangrene, where the scarifications are used, or in an open and gangrenous stump.

## OF BROKEN OR DISLOCATED BONES.

A great ball, grazing obliquely, often breaks a bone or dislocates a joint, and yet does not harm the skin; and where this happens, you can seldom prevent gangrene: Very often the skin is blackened into a perfect eschar, the blood that is extravasated below the skin is mixed with muscles beaten into a mere mash; and the bones within, are broken into many pieces, the periosteum being thoroughly destroyed. In this case, you must make your incisions through the dead skin, as in a gangrened part, and apply your hot turpentine and your stimulant fomentations; and after the natural suppuration, or after your incisions you search down to the bones, take away those that are loose and broken, and compose those which are to remain, by laying the fractured limb upon a small pillow, smoothing and setting the fractured bones with your hand.

But if the bone only be broken by the weight of the ball, while the skin is untouched, you must not open the skin! perhaps the ecchymosis may be absorbed, and the parts injured in their texture may be restored; you are, therefore, not to open the skin, but to compose the bones which you feel broken, to lay them gently with your hand, and to set the limb easily, as in any common fracture of the same bones; and moisten your bandages with fomentations of the discutient and spirituous kind.

## OF WOUNDED ARTERIES.

Thus you perceive that fractures of the bones, besides the unavoidable attendants, viz. large suppurations and tedious cures, often end in gangrene.—But all these dangers must be increased when the artery also is wounded; in such case, your incisions must be free, your arteries must be fairly taken up, and you must watch the gangrene, and the time of the secondary bleeding: But, in this case, your patient's safety chiefly depends upon your

doing your operation boldly at the first, with a free incision, and tying the artery securely. Belguer forbids amputation, while one rag of the member remains ; and will not allow it to be done in cases of wounded arteries, any more than in shattered bones : Let the surgeon, says he, suppress the bleeding by agaric or styptics, or let him take the arteries fairly up. Nor will he allow of amputation, even after wounds in a main artery of a limb. But we must not allow the violence of an enthusiast of this party to prevent our duty ; for we feel too often the difficulty of saving the limb, even in a simple case, to doubt of there being most imminent danger in such a complicated wound : Often, very often, limbs are lost when the femoral or humeral arteries are wounded with the clean cut of a knife.—What issue, then, have we to look for in a wound of the main trunk, attended with a bruised and gangrenous fore, and with fractured bones.

Perhaps, then, the short rules of this case might be these : 1st, If the artery, even of the thigh, be wounded, with merely a flesh wound, we must try to save the limb, though that will not be easy. 2d, If the artery of the thigh or arm be wounded, together with fractures of the bones, there is no reason to hope that the limb can be saved, and making the attempt is but risking the life, for a very slender chance of saving the limb. 3dly, Though the tibial and fibular arteries in the leg, or the radial, ulnar, or interosseous arteries in the arm, be wounded, although it be with a fracture of the bones, the leg or arm may sometimes be saved (but that with great difficulty, and not without danger) by cutting up the wound, tying the arteries, and picking away the splinters of bone.

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#### OF WOUNDED JOINTS.

The wounds of the joints are so dangerous by their high inflammation, that they may be fairly enough compared with wounds of the great cavities, inflammation, and pain, and violent fever ensue ; often the patient dies delirious on the first days, or

If he survive these first dangers, it is to die by a great flow of matter, hectic fever, erosion of the cartilages, and spoiling of the bone ; and neither can bleeding appease the inflammation, nor opium relieve the pain, nor bark nor diet support him under the vast discharge. We here pronounce more freely the opinion which we too often need to deliver in common practice, that openings into inflamed joints are fatal ; and though there are in every book cases of anchylosed joints, we cannot but remember that, for one that has escaped by anchylosis, thousands have died. In this case, viz. of wounded joints, bleedings, poultices, and emollient fomentations, constitute almost the whole that surgery can do. The wounds are to be dilated, the fragments of bone extracted, the patient laid quiet, and the limb as easy and soft as may be ; nothing should be suffered to disturb the patient ; he should have large opiates given him, to abate the irritation and excessive pain ; and, though bleeding may perhaps be allowable at first, yet our chief difficulty lies in supporting the strength of the patient during the tedious cure.

This laceration of a limb in which its bones are broken, and its texture apparently destroyed, where the danger of gangrene is immediate and pressing, and where the chance is but poor of saving the limb, even after thus risking the life, requires immediate amputation. The laceration of the great arteries, accompanied with driving of blood among the muscles, and with fractured bones, is also a case requiring immediate amputation. The wound of a joint, although in the end it commonly occasions the loss of the limb, does not in general run into immediate gangrene ; there is of course time to attempt a cure, and the opportunity of saving the patient's life is not absolutely lost by that delay.

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#### OF BRUISED AND GANGRENOUS STUMPS.

There is but one case more to be explained,—that is, the dressing of a ragged stump made by a great ball ; for, those who condemn amputation in other desperate wounds, treat this also as a



mere wound, and will not allow any thing like a new amputation to be performed, but dresses the stump in the following manner \* : When a soldier is brought into the camp with a thigh or arm so shattered, that only some ragged flesh or skin remains, they cut that away, then with the scalpel they cut the ragged flesh as neatly as may be into the form of a regular stump, then cut the larger pieces of bone away with a little saw prepared on purpose ; the lesser fragments they cut away with the scalpel, and they pick the stump clean with the fingers or with small forceps, (some smaller fragments, no doubt, being left for suppuration). Then squeezing and handling the bone, they try to mould the remains of the limb into the fashion of a stump, the flesh being thus pressed down to cover the shattered bones, and the bones themselves so arranged by the pressure, that if they be split upwards, the split is forced together, and such fragments as may be preserved, are made to adhere ; at least, Belguer plainly says, that by such pressure the fissure of a split bone may be lessened or closed. There is often no bleeding, no arteries are taken up ; and sometimes these stumps never bleed during the cure : The stump is dressed dry with lint, rolled with a gentle bandage, firm rather than loose, and the stump and bandage are thoroughly soaked in spirits of wine. At every future dressing, the surgeon is obliged to look for new splinters of bone, and often to give new pain, by new pickings of the stump ; and the truth is, that such a stump is even from the first moment little better than a gangrenous surface, with a black and bruised appearance, ragged muscles and blackened skin, tendons hanging from it, and shattered bones remaining, which the surgeon dare not, or cannot take away ; and almost from the first the surgeon is obliged to use hot dressings, turpentine, and balsams, to correct the fetor, and suppress the profuse gleety discharge. But the eschar which is essential to a gun-shot wound, the whole of the blackened and mortifi-

\* I mean, in the following description, to represent this practice of Belguer, the celebrated Prussian surgeon ;—and merely to represent it to a well informed English student, is, I believe, criticism enough.

ed surface having sloughed off, there is danger of a secondary bleeding ; and the stump originally ill formed (and which all this squeezing and modelling could not bring into a right shape), now loses much of its substance ; what is left being pale, flabby, and ill conditioned in the last degree, accompanied with that profuse discharge of which the patient so often dies ; there is an exfoliation of bones which seldom is completed in less than six months ; and at the end of this tedious confinement, the patients go out from the military hospitals with stumps where the bone projects, covered with a thin cicatrice, seldom without ulcer, or at least ready to break out into ulcer with any rude touch ; such as reminds them every moment of their loss and of their unhappiness.—During the whole of such a cure, we have to be as watchful of bleedings, as diligent in extracting and cutting the diseased bones, as anxious to keep off fever, and prevent the diarrhœa or the gleetings from destroying the patient, as even in the ugliest fracture of a limb ; and yet without the comfort of preserving a limb, which, however awkward, would be much more useful than a conical and tender stump. There remains but one thing to complete the view of this case, and I say it boldly, that even this imperfect cure is seldom accomplished till after labouring thus, through every danger, for four, five, or six months ; and I appeal to the writings of Belguer himself, who seems as proud of such a distressing scene, as if all were well and easy with the patient ! Even this is what he boasts of as one example of his success !

I have now explained to you all the varieties of wounds in the limbs ; the wounded joint, the lacerated artery, the bones fractured and luxated, and the whole limb carried away : Nor was it possible for me to explain the practice in these several accidents, but by representing the dangers of each case. I have been guided by no secret design of exaggerating the difficulties of such wounds ; and yet the simple truth cannot but impress your imagination very strongly. It is, indeed, a scene which must alarm you, and make you ready to pronounce : “ There is no way surely of saving our patient, but cutting off of such limbs.” But

that you may be warned against all hasty conclusions, that you may have all reasonable hope and confidence in the powers of nature, I shall deliver short notes of a few chosen cases ; they will prepare your mind with knowledge, for the great question which I propose next to explain to you ; I mean, Whether, in such distressing circumstances, the limb should be cut off or not ?

You will not be surpris'd, to find me begin with relating the successes of Mr. Belguer ; for you have heard of his great name. —He was chief surgeon to the last King of Prussia, and had the command of all his hospitals. He had seen the ill consequences of amputation in the former years of the war, and resolv'd, that, from the date of his authority, not one amputation should be performed ; and accordingly, from the date of his command, not one amputation was performed in all the Prussian army. Full 6000 wounded men were left to sink or swim ; for, how much soever a leg or arm might be lacerated, amputation was not allowed ; if such a limb could be cured, it was cured ; if it gangrened, the gangrenous mass was scarified and scraped away. If there was an entire sphacelus, and the leg fell off, the Prussian surgeons did no more than merely sever the dead bones from the half dead flesh, leaving the rotten stump to heal, if it could heal.

Now, when all the wounded of a camp are left thus, with wounds of all kinds, to take their fate, to live or die, it is no wonder, though some very singular cures appear ; and, therefore, there is no book which we should sooner look into for miraculous cures, than that of Mr. Belguer.

Mr. Belguer conducted himself through his plan with a wonderful perseverance, and stood out scenes of distress, which I shall represent to you by and by ; at present, it is rather my business to present you with some examples of his success.

He cured a soldier, whose arm was so miserably torn by four grape shot, that the humerus was broken in the middle. There was an aneurism, as big as a fist, at the bend of the arm ; but whether of the main artery or not, he does not say. The wounds were dilated, the broken bone laid bare, several large splinters taken away, and the remaining splinters smoothed and applied to

each other, by moulding the arm with the hands, and rolling it with a gentle bandage, moistened with spirits of wine. He laid thick hard compresses, and a tighter bandage, over the aneurism; and thus, without farther help, he performed the cure in three months.

He gives, next, another case of less importance, of a wound of the fore arm, cured by the same process, of dilating the wounds, and extracting all the fragments of bone.

Next, one of an officer, who was wounded with a ball in the middle of the leg, had betwixt three and four inches of the bone cut away, and yet was healed.

Next, of a foldier so wounded in the leg, that Belguer cut away no less than five inches of the tibia, and picked the splinters of the fibula away, put the bones together, and accomplished the cure, though not without a great shortening of the limb.

Next, of a nobleman of the name of Franckenberg, who was so wounded in the foot with a musket ball, that his surgeons hooked out, in a manner, all the bones of the foot, and yet he recovered so as to walk with a high heel.

An ensign recovered from a wound, with fractures of the leg.

A foot foldier, of the name of Mieke, had his arm so battered by a cannon ball, two fingers breadth below the shoulder joint, that five inches of the os humeri were taken away.—Yet, in nine months he recovered, but was ranked as an invalid.

An officer having received a wound, or rather a bruise, very like this, was cured in eight months.

Two officers, who were wounded in the shoulder joint, were cured in about ten months.

A gentleman, of the name of Britzke, who was wounded with a musket ball in the elbow joint, was cured in two years.

The case of one of his princes brings up the rear :—He had been wounded in the foot, at the root of the metatarsal bones; and though the bones of the tarsus were much broken, he was, by incisions and balsams, restored to the troops.

Of 300 who were wounded in the limbs, and with fractured bones, these are the examples which Mr. Belguer has chosen as

surprising cures.—But how naked and bald of circumstances these cases are, I need not explain to you ;—you must feel that from a want of detail, they are but ill calculated to make any lasting or lively impression on your minds ; but the bareness of these cases will be compensated by the interesting nature of others, which I shall now relate.

M. Boucher, a French surgeon, cured a young man of nineteen, of a vigorous constitution and sound health, who was shot with a musket, at so short a distance, that the ball, passing clean through the thigh-bone, wounded a woman, who stood near him, in the foot. The thigh bone was broken just above the condyle ; it was so shattered that about four inches of it were taken away in splinters : The ball did not injure the artery, nor touch the joint ; but the man being drunk, did himself much harm in attempting to rise. On the following day, there being much swelling, fever and pain, amputation was proposed to him ; but he refused to hear of the operation, and his surgeons were bound to do their best to save his life ; they took away many splinters of bone, dilated more particularly the backmost wound, that the matter might be more freely discharged : There followed three suppurations around the knee, but none of them apparently affecting the joint ; the openings for these abscesses discharged more splinters of bone ; the inflammation ran high, gangrene came on ; at last, a line of separation appearing, dividing the mortified from the sound parts, amputation was now a second time proposed ; but the consultants could not agree :—A slow fever and diarrhœa wasted him for a month longer ; but still he lived. Now, in the third month, new suppurations appeared in the upper and inner part of the thigh ; another collection of matter formed under the fascia lata on the outside and top of the thigh. These abscesses were freely opened, and discharged some more bones ; the suppuration, notwithstanding the patient's irregularities, went on well, and in ten months the abscesses were entirely healed. Then the bones knit with a firm callus, the joint played freely, the limb was serviceable and strong ; it was straight also, but it was four



inches shorter than the other, which was exactly the extent of the wound in the bone.

In this case, the bone only was wounded ; there was no wound of the joint, no hurt of the artery ; and yet the cure was not accomplished till after ten long months of suffering, with fevers, diarrhoea, painful suppurations, and profuse discharge.

Mr. Theri attended one of the servants of a monastery, who, while holding the bridle for one of the religious, was wounded by his pistol going off as he was mounting. The wound was in the elbow joint. The shot struck the condyle of the os humeri, and carried off also the olecranon. The usual incisions were made ; but the swelling was so great by the fifth day, that his surgeons were obliged to make new incisions of the wound ; they were moreover obliged to cut up the fascia of the fore arm. The inflammation, still advancing, extended quite to the shoulder, and threatened gangrene : The scarifications, bark, and stimulant applications, saved the arm from total gangrene ; but after this, abscesses formed all round the fore arm : But these sufferings and dangers being over, the patient was cured in eleven months : It is very singular, that by the use of baths he recovered even the use of the joint. In this case, as the gangrene was actually begun, the patient made a narrow escape.

An officer of the Irish Brigade, also wounded in the elbow at the battle of Fontenoy, had the lower part of the shoulder bone fractured with the musket-shot, and the olecranon much damaged, though not entirely shot away. He also suffered such dangers, that he was condemned by his surgeon, Mr. Guerin, to suffer amputation, and had given his consent ; but, prevailed on by the tears of his wife, he retracted this promise. He also was saved from gangrene by the scarifications and other means ; the dressings were thoroughly soaked with a bloody serum, which augured no good, and many scales of bone were discharged before his surgeons could accomplish the cure ; the cure also was less perfect, since it was not accomplished but with a stiff joint. The period of this cure is not recorded, but we see that he escaped.

ed from great dangers even in the first instance ; and we are told by the author, that his cure was tedious and very painful.

Mr. Boucher cured also another young man wounded in the thigh bone. The ball had passed through the condyle ; but so tedious was the cure, that, during his confinement, the other leg grew so much, that though the wounded thigh bone was touched only in the condyle, and nothing abridged of its length by the fracture, the young man, by the growing of the sound leg, while the wounded one continued stationary, had a great halt in his gait. This young man, you will easily guess, must have suffered much to obtain this cure : There were first deep incisions made into the two wounds, then many splinters of bone pulled away ; then turpentine dressings were applied, and great pain and swelling, convulsions also coming on, they were on the sixth day obliged to cut the ham-strings, and to make long incisions quite up to the middle of the thigh. Eleven months was the period of this young man's cure ; and surely, in confinement, fever, and discharges of bones, he bought it dearly.

One man recovered under the care of Mr. Boucher, who was shot across from the inner to the outer ancle ; and another patient had the head of the shoulder-bone broken by a ball ; which, passing from behind, forwards, raked along the course of the clavicle, till it came out at the end of the clavicle, next to the sternum. There were, in this case, shiverings, fever, and an ill-conditioned discharge. Inflammations and great suppurations extended quite down the fore arm, and he left the hospital not till after nine months distress, and with a fistula in the joint, which mineral waters cured at length, so that he could do every thing but raise his arm.

In besieged cities, or in the trenches before a besieged city, most of the wounds are from great shot, or by bombs, or by great splinters of stone ; and, in such wounds, the limbs are so miserably broken, that, in most of the cases, amputation is necessary ; and so well established is this maxim, that Mr. Cannac of the French Academy pronounces this opinion, even while he is in the very act of relating one of the most wonderful recoveries that

stands upon record. It is the case of an engineer who was wounded with a bomb ; the bomb threw him down, broke the leg and foot, and so shattered all the bones, that the leg bended in one direction, the foot hung away in an opposite direction, several inches of the tibia and fibula were pulled away, and many pieces of the bones of the foot were discharged ; and but a few days after this wound, the French being obliged to fly from the city, which was besieged, were forced to carry him in this miserable condition to Cambray. No wonder that, in the very first consultation upon such a wound, amputation was proposed, and was freely consented to ; but, by many successive accidents, it was deferred and deferred again, till the moment in which they were obliged to fly.—After various dangers (which, from what I have explained to you of such cases, it were very needless to relate), he did recover ; but it was such a recovery, that Mr. Cannac declares, that his long sufferings and imperfect cure being considered, it had been better for him that they had cut off his leg ; for it was short, and deformed ; and he suffered eight years of operations, dressings, and mineral waters : The patient was two years under the immediate care of his surgeons, and six years more wandering about watering places, with open sores, and exfoliating bones. Eight years, in the flower of life, are a dear purchase even for a perfect cure.

The case, with which I shall finish these singular instances of success, is that which immediately follows in Mr. Cannac's Dissertation, and which he joins to this with great sense and judgment ; for it makes the lesson complete. An officer in the same besieged city was wounded in the ankle with a hand-grenade ;—and, believing himself more frightened than hurt, he tried to walk out of the work which he commanded ; but his leg was benumbed, and his soldiers were obliged to carry him out. The wound was merely a flesh wound, an inch and a half in diameter ; there was no wounded artery, nor any appearance of a broken bone, but it was of course a bruised wound. I need not relate to you all the symptoms, the tension, and swellings of the limb, the threatening of gangrene, the sloughings and incisions,

all the sufferings of the patient, and all that was done for him. The whole is told in one word : He had seen the officer, just mentioned, saved after a more terrible wound. Mr. Cannac proposed amputation ; but this gentleman refused, and his expectations raised too high, from what he had witnessed in the other case, cost him his life.

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Thus have I given you a fair transcript of many wonderful cures ; and the best comment, perhaps, that I can make on them, is delivered in the following sentence of Mr. Boucher : “ Decided as I am in writing against amputation, and great as my confidence is in the powers of Nature, I confess, that we ought not to look for miracles, nor trust blindly to her powers. There are many cases, where we can have no reasonable expectation of saving our patient, but by cutting off his limb \*.” This is the great question to which all the cases above recited tend. It was to show the dangers of amputation, that they were mustered up by the French and Prussian surgeons, but every effort of this kind, if we take it in the right sense, will but alarm us, and not quiet our minds. You have had these cases translated to you fairly and honestly. But in glancing your eye backwards, you see, in true perspective, all the dangers of a nine months cure, which is but a weary travel, step by step, betwixt life and death. You have, in this view, the dangers of frequent fevers, wasting diarrhoeas, foul and gleety sores. You see some dying suddenly of gangrene, some wasted by the profuse discharge, and successive suppurations, new incisions, unexpected discharges of spoiled bones ; you see those who recover, halting on limbs so deformed and cumbersome, that they are rather a burden than a help. You know, in the very moment that you hear of such a cure, how much the patient must have suffered, and how poorly he has been cured ; and you can, from the long sufferings of those who escape, tell, but too truly, how many must die.

From these reflections, you will be inclined to prejudge the great question of amputation, or of saving the limb. But however you pronounce on that point, I beseech you to learn the following humane lesson, from the practice of these, the greatest surgeons in France : When your opinion is called for, pronounce it boldly ; and say, if you think it right to say so, this limb must be cut off. But when you are prevented by officious relations, or if the patient should refuse his consent, when the accidents of the case interrupt you, or you are in an irregular and dangerous camp, where operations cannot be done, then do whatever remains of your duty, not with the ill humour of a man thwarted in some little view, or smarting under the sense of a disappointment or affront ; set yourself heartily and kindly to save your patient's limb and his life.



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## DISCOURSE VIII.

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### ON THE QUESTION OF AMPUTATING SHATTERED LIMBS.

THE best operations are sometimes abused, and so is amputation abused ; the most dangerous remedies are sometimes required, so is amputation. I do not admire the reasoning of those who, through an affected confidence in the powers of Nature, are continually declaiming on her miracles, her wonderful powers, when they see hundreds dying around them on every side ! Where is the deadly disease from which some few have not been restored ? These men have the talent of representing one single case as an argument against a general practice ; they bring a few successful cures into the full light, while their conscience tells them that hundreds are dying in secret. Nor can I, on the other hand, reconcile myself to the practice of those who are so proud of surgical operations, that nothing seems well done to them, unless it be done with the knife, I may say, by main force of surgery. These surgeons set themselves, not over Nature, to regulate or assist the operations, but above Nature, to controul and force them. Feeling as I do the danger of either extreme, I shall endeavour to direct you in this difficult question, Whether in certain circumstances you should amputate the limb, or try to save it ? I shall endeavour to direct you to the sensible and modest plan of conduct ; and lay before you such rules, as will enable you to assume a conduct neither too timorous, nor too forward.

Allow me to say to you, first of all, that questions of practice should be decided, not by authorities, for these are the opinions of men, of mere men ; and we know too well how strangely a man's opinions grow up in him, distorted by a thousand accidents. But

they should be determined by reason and experience, which is the true basis of opinion ; for, after all authorities are laid down before us, still the true spirit and reason of our rules remains in the nature of the thing itself : if we can once find out that reason, it must serve as the principle of our practice ; and though opinions, authorities, and names, might put us wrong, that will never deceive us.

If there be a great fracture of the elbow or knee, who shall deny that the man may live and recover ? But are there not a thousand alarming reasons to believe that he will die ? If there be a fracture of the tibia and fibula, and if at the same time the great blood vessels are cut, is it not possible that our patient may escape this terrible complication of aneurism, fracture, and bruised wound ; may he not recover from the gangrene ; may he not outlive the diarrhœa and profuse discharge ; may not the fever be kept under : but still the question comes upon us, may he not rather die ? Then, if so, it is the duty of the surgeon to pronounce that, though he may live, there are many chances that he may die ; and, though fifty recoveries should be produced from books, that would not bias his judgment. He knows all the dangers, and fears them, and advises amputation ; but if it be refused, he is not offended : and as he feared these dangers, he rejoices if his patient escape from them.

The setting up exceptions as an argument against general rules, is very poor reasoning ; since every exception does in fact prove its own rule. This manner of reasoning is most dangerous to the young surgeon ; it hurts his mind, makes him irresolute and timorous, where he should be most decided and bold ; obedient to the ignorant fears or wishes of his patient, when his patient should rather be submissive to him, confident in his judgment, and contented with whatever he resolves. Does not Mr. Boerdeneave himself, the chief of those who have argued against amputation, acknowledge to us, that such successful cases are deceitful ? He concludes a long list of wonderful cures, with this remarkable sentence : “ I know well how many examples are related of wounds of the bones and joints cured without amputating ; but

those examples, seducing to such only as are little conversant in practice, never can establish a general rule \*.” General rules and particular exceptions are opposite, and yet necessary to each other, like light and darkness, without the one the other cannot be distinguished.

I shall go once more over the points of practice which I have lately enumerated, taking them up in their order, of a shattered stump, fractured bones, wounded arteries, and open joints.

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### 1. OF SHATTERED LIMBS.

Mr. BELGUER, in the very second paragraph of his book, declares, that he had often cured those, who, having the leg or arm shot away by a great ball, would, according to the common practice, have suffered a regular amputation of the stump. Now, if Mr. Belguer means to say, that it is better to clip and pare such a ragged stump than to cut it off, his opinion amounts to this plainly, “that the lacerated stump left by a cannon ball is as good a stump as one made by a regular amputation, is even less dangerous;” and it would follow, if this were true, that all our trouble about neat amputations were very foolish: why indeed should we not return to the old method of Botallus, namely, by the guillotine, for that would make a clean amputation, as quick, and with almost as little pain as even a cannon ball; but it would leave a stump, I fear, little better than those which Belguer would palm upon us for good ones. Although, after all, partly from modesty and consciousness, perhaps from prudence and a fear of contradiction, he does acknowledge to us, that he cured such stumps only so so, “*fatis quidem pro noxæ ratione feliciter curato.*” But although Belguer had said boldly, without this qualifying expression, that he had easily cured such stumps, he could not have been believed. We must examine every such

point, no doubt, by authority in the end, but first of all, by the nature of the fact itself.

I ask whether it be in the nature of things that we can bring into the condition of a sound and healthy stump, splintered bones split up to the heads, joints shaken and bruised, ragged muscles, and strings of tendon and skin hanging round the stump, and a whole surface so nearly in the condition of proper gangrene, that it hardly can escape? How shall we take up arteries which cannot bleed, but which are soon to fall into gangrene and bleed when we are least prepared? How shall we restore to any sound condition, parts so destroyed in their form, and ruined in their texture, and in their vital powers, that they can be cured only by sloughing, i. e. by gangrene? How shall we clip this stump into any shape, or pick away the loose bones, or roll and compress the split ones as Belguer directs, without operations more painful and far more tedious than actual amputation?

If there be much difficulty in healing a regular and good stump, what must not the danger be of such a stump as this? Where no vessels bleed, where none are tied, where, in the course of the sloughing, dangerous arteries will burst out, where a stump already ill formed and irregular, must still lose somewhat of its substance by the sloughing of the bruised flesh. Indeed, in such a case, a conical, ulcerated, and painful stump will be the only reward for long suffering, and many tedious exfoliations or sawings, perhaps, of the fractured bones. No wonder that we have such a modest declaration from Belguer, we cured such stumps, says he, in four or five months, "*satis quidem feliciter pro noxæ ratione;*" or in plain English, as well as we could, considering what ugly, lame, painful, and useless stumps they always make.

Whether it be the pomposity of his language, that has deceived us, I cannot tell; or whether the world be too willing, as I fear it is, to trust to bold assertions, though supported with but slender proofs: yet so it is, that Belguer has got credit for all that he has said, and for much more than he has done. His assertion is, that he had cured a great many who had their limbs

entirely shot away, this we find in his second paragraph : but presently after, comes a long history of the miseries which these poor wretches suffered during their confinement of six months. These accidents, as he calls them, (though I fear they are rather too frequent to be explained honestly by this old name of ACCIDENTS) ; these accidents, I say, are enumerated in his twenty-first paragraph, where we are told of the manner of pulling away the rotten bones at every new dressing ; of balsams for preventing an excessive discharge ; of pulling the bones when they do not come out of the stump ; and of sawing them off, when we find that we cannot pull them out ; of bark, and soups, and diets for supporting the strength ; of fevers and of febrifuge drugs ; and of the ugly changes that come upon the stump, when the fever comes on.

But the winding up of his subject is the most curious of all, where he tells us :\* “ Concerning these same lacerated legs and arms, when the member is torn away from the body, I must add, that, as far as I know, not one of those who had lost the thigh, were brought into our hospital ; I have little doubt but that every soul of them died of bleeding. Some, indeed, of those who had the arm blown away, were saved by the surgeon’s tying the arteries and dressing them upon the field of battle.”

So that after the fairest examination, Mr. Belguer’s success goes just thus far and no farther ; that all those who had the thigh carried away, died of bleeding ; that some of those who had the arm carried away were saved ; that many of those who were thus saved, after losing the arm, or of those who lost smaller parts, as the hand, or fore-arm, or foot, were cured as well as could be expected, “ *fat is feliciter pro noxæ ratione,*” after five or six months confinement ; and as for the fevers, diarrhœas, carious bones, and profuse discharges, the shape of the stumps, and their value to the poor fellows ; all this must be left to the imagination of his reader : and though the imagination be not indeed a calculating faculty, it is the only faculty we have left us for representing the proportions of these cures ; since Mr. Belguer, al-



though he tells us, when he entered upon his duty, how many wounded he had, and how fast they died in former years of the war, and how easily he saved them by the new plan, has yet never condescended to number the stumps which he left upon the Prussian establishment.

Those, says Mr. Martiniere, who thus declare against amputation (in shattered stumps) do make the very worst kind of amputation. Mr. Ranby was so intent upon preventing these dangers, and on having these amputations early performed, that he advises the surgeons of several corps to collect themselves into small groups, and plant themselves behind the line, in forming for an engagement ; and indeed, tents are usually prepared, where all such sudden operations may be performed upon the field.

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## 2. OF FRACTURED BONES.

THESE shattered stumps are nearly an epitome of all the dangers which assail us in the case of a wound with fractures of the bones ; for there we find, as in this case, tedious exfoliations, diarrhoeas, fevers, and profuse flux of serum or pus ; but great as these dangers may be, they have no influence on the spirits of those who are bent up to a doctrine ; and accordingly Mr. Belguer never cut off one single leg nor arm. He had seen the ill success of amputation in the former years of the war, and was resolved he would not allow of an amputation, no not one, however dreadful the case. His enthusiasm could not perhaps be told but in words which must seem spleenetic and rash ; but, to avoid any feeling of this kind even in my own mind, I shall simply translate his paragraph.

“ The second case in which surgeons usually amputate, but which I have always cured, is that where a musket-ball, grape, grenade, or any piece of iron, stone, &c. broken by shot, wounds the bones of a foot, or hand, or leg, or arm, so that they hang from the rest of the member loose and vacillating.” (He represents the foot or hand as absolutely dangling ; “ *tan misereye*

contusa ut huc illuc labet pendeatque," p. 43.) This is the mere enthusiasm of the thing ; and when we find a surgeon pretending always, or almost always, to cure such wounds in which a foot or hand are left dangling from side to side, " huc illuc labentes atque pendentes," we are bound to examine into the nature of such wound, and try whether the nature of the thing and this bold testimony will agree.

When a gentleman, falling from his horse, has broken his leg, and there are projecting bones, though he is carried softly to town, laid in his own house, has the happiness of his friends around him, and the advice of the best surgeons, still we are not without our fears. But when a poor fellow is wounded, who, by the duties and hardships of a military life, and all the fatigues of a long campaign, is become sickly and weak ; when his knee is wounded with a musket ball, and all the bones are broken ; when his leg is so fractured by a cannon ball, that the bones are reduced to splinters, for the length of many inches, and the muscles and extravasated blood lie like a mixed and gangrenous mass below the skin ; when to these injuries are added, perhaps, lacerations of the chief arteries, what can we do ? Is this a case to be cured in any circumstances ? Is it to be cured in an hospital, where, as Belguer himself tells us, there are miserable beds, scanty food, and poor clothing ; where there is nothing but cold and nastiness, uncleanness and infection, and putrid sores ; where new crowds of wounded pour in upon them after every battle, with tales of misfortune or success always agitating, sometimes alarming ? There is, in short, no kind of wretchedness that is not seen here, and none which Belguer does not freely acknowledge. Is it then to be believed, that a man thus wounded, can be saved, after being thrown into this charnel-house, amidst the cries of the dying, the sights of the dead, and all the horrors of infection ? What is it that Boerdenave means, when he declares, " That these tales of success are seducing, only to those who are not skilled in practice." Surely, he means by skill in practice, a knowledge of the manifold dangers which attend on such a wound ; he must mean, the knowing what fate awaits those whom we shall attempt to

save ; such a scene must be witnessed too often in the best regulated hospital ; but where (as in the Prussian hospitals) no limbs are cut off, the scene must be dreadful indeed. If all limbs be preserved, many must gangrene ; if no amputation be performed, all the shattered stumps must gangrene ; then the sloughing stumps and gangrenous limbs, the exfoliating bones, long accompanied with a serous and putrid discharge, must infect the whole, so as to make the hospital a lazaret-house of stinking sores. There, as Belguer acknowledges, diarrhœas, dysenteries, fevers, and all kinds of diseases prevail ; and there is often a sudden changing of the wounds, and a sudden changing of the health also, which he finds it difficult to fight against with his bark and wine ; and I fear there were often sudden changes of another kind, which he is too unwilling to confess. If every stump took five months in being healed, and every fractured limb endured a nine months cure, you may conceive more easily than I can explain to you, the emaciated squalid figures of such an hospital, striving to raise themselves in their beds ; and the miserable condition of those, who, after such a nine month's cure, crawled out of such an hospital, as if rising from their tombs. If this be what Boerdenave means by skill in practice, we may, with great security, add Mr. Ravaton's aphorism to his warning, and say, "Wherever the thigh bone has been entirely broken (by a ball, viz.), I have seldom seen the patient saved." And we may add also that of Mr. Boucher's, who, though himself an enemy to amputation, allows, "that the limb must be cut off, whenever a great bone, as the thigh bone, tibia, or fibula, is broken with deep fissures, or with projecting points of bone, which we cannot cut away, or where such bones are broken in several places ; or where the head is broken from the body of any of those bones, nothing but amputation is to be looked to." He allows, also, that the symptoms, during the cure of such a wound, may require amputation ; as twitchings of the member, such as are in danger of being communicated, and so causing general convulsion ; caries of the whole thickness of a great bone ; flabby sores, serous and profuse suppurations ; and, finally, gangrene, in

which it was never doubted, that amputation was the sole resource. And a great ball crushing the bones of the leg, or disordering a great joint, as the knee, though it should merely fall upon it by its own weight, surely cannot be cured but by amputation." Mr. Boucher acknowledges justly, "that whatever the dangers of amputation may be, yet we know, that there are certain cases where it cannot be avoided \*." Mr. Kirkland's rule is a sensible and correct one: "That in compound fractures of the long bones of the extremities, we should act on the side of probability; if there be a probability of saving the limb let it be saved; if there be no hopes of a cure without amputation, let it take place without loss of time." The wonderful recoveries which Mr. Kirkland has recorded, after the crushing of limbs, by waggon wheels, are instructive and encouraging; we should venture almost any thing in fractures of that kind; but when made by a cannon ball, and complicated with much ecchymosis and wound, the danger is more pressing.

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### 3. OF A WOUNDED ARTERY.

WITH a wounded artery, we know how hard it is to perform a cure in any case, but in a case of wounded artery, with the complication of shattered bones, a bruised wound, a rising fever, and a swelling of the wounded limb, I venture to say it is next to a miracle, if the patient escape gangrene. Such a wound is like that recorded by Kirkland, of a poacher who was shot in the arm with a horse pistol loaded with very large shot, the mouth of the pistol almost touching his arm: The humeral artery was torn to pieces; the laceration of such a wound prevented bleeding, but the whole arm being violently bruised, gangrene came on; and when Mr. Kirkland saw him on the third morning he was dying of the gangrene.

Thus, in aneurisms, says Mr. Kirkland, "Amputation may, or may not be required, according to the accidents of the case." In a simple aneurism, as from bleeding, there can be no doubt of sa-

ving the limb ; but this complication of aneurism in a great trunk, with a lacerated and fractured limb ; or, in plain terms, a gun-shot wound, with a lacerated artery, is the very case which can hardly be saved. If we enter at all into debate upon the question of cutting off a fractured limb, without any wound in the artery ; surely the question should be very easily resolved, where that also is added to the other dangers ? If the artery merely be wounded by one ball, or one slug, though it were the femoral artery, as in the case of the gardener recorded by Desfontaine, even after such wound in the femoral artery, we may save the limb ; but when, as too often happens, the bone and the artery are both wounded at once, the patient can hardly be saved.

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#### 4. OF A WOUNDED JOINT.

As for a wounded joint, take the united experience of all surgeons which has established this, as the true prognostic, that “ WOUNDS OF THE JOINTS ARE MORTAL.”

Hippocrates says, that wounds of MEMBRANOUS PARTS are mortal. Now what Hippocrates meant by this, is very plain : He judged these parts nervous ; for the old physicians had confounded the idea of membranes and nerves ; and wounds of the white or membranous parts were thought to be still more dangerous than the wounds of nerves. Here then we perceive, that this old aphorism is a doctrine, not a fact : But when a modern surgeon says, wounds of the joints are mortal ; he does not put forth his hypothesis, he merely declares a fact which the concurring testimony of all surgeons confirms. He knows, that a rash incision into a joint will, like an accidental wound, occasion a very painful and sudden death ; he knows, that a mere cut upon the joint, through its capsule, is a terrible accident, independently of fractured bones, or a great laceration ; but that if these be joined, the patient can hardly escape : And such is his faith in this aphorism ; he sees it so often confirmed by experience, “ that wounds of the joints are mortal,” that, instead of seeking to lay down



proofs of this danger, a writer leaves it to the recollection and experience of every surgeon ; he dwells upon some hopeless case, which he or his friend has had the good fortune to cure ; instead of accumulating useless proofs of an acknowledged principle that such wounds are mortal, he gives rather exceptions, knowing that, according to the lawyer's adage, "*exceptio firmat regulam*," that the exception but confirms the rule ; though, what he means to record as a mere exception, is too often understood by the student as an imperfection in the general rule, and the very report of the exception throws him back into a hesitating and uncertain state of mind ! Thinking only of this wonderful recovery, he willingly forsakes an uncomfortable rule, to lay hold on this one glimpse of hope, while indeed, if he reasoned fairly, he would perceive that the exception should be lost in the fulness of the general rule, and not the general rule disturbed by the exception \*.

There is one representation still wanting to complete the discussion of this subject :—It is the sad condition of soldiers, with whom too often their wounds, as wounds, are but the smallest part of their danger.

Those who have been much accustomed to see men conveyed

\* The young surgeon never should allow himself to forget how this confusion comes about. There is no difference of opinion, for no one is giving an opinion ; every surgeon in the kingdom delivers into some valuable repository the accidents of his practice, the wonderful recoveries thus rise up to the surface, while all the miscarriages sink down to the bottom, and are never more heard of ; so that wonderful recoveries are every where soliciting the student's attention, almost every case he reads is an exception to some general rule ; while there is no systematic writer busy in supporting and settling the general rules, or in confirming and establishing them against this host of exceptions : Wounds of the heart, wounds of the pericardium, wounds of the bowels, wounds of the bladder, wounds of the stomach, wounds of the brain, wounds of the great arteries, wounds of the joints, are all mortal ; and yet the list of exceptions, that might easily be extracted from the indexes of case-books and collections, is endless. Let not these move the judgment of a young man, when he first enters upon the practice of his profession ; and, when he is old, he will have no need for caution like this ; general rules will then have got the due ascendancy in his mind, these little exceptions will have fallen to their right level.

wounded from the field, with lacerated arteries and broken limbs, declare to us, that their cries and sufferings are most affecting. The army, indeed, which goes onwards, leaves its wounded safe behind ; but, in retreat or flight, and, after a day of fighting, which is a day of fatigue, what must be the condition of thousands left upon the field, or thrown in heaps upon waggons or carts, and hurried along the roughest roads, from post to post, with bleeding arteries and shattered limbs, and with points of bone piercing the flesh, and exciting, at every step of this terrible journey, the most dreadful cries ? Some fainting with loss of blood ; others writhing with pain, many delirious, and many suffering under the convulsions and agonies of immediate death. There the officers, and soldiers, the dead, and the dying, all thrown together in waggons, are put down in the nearest hospital to take their fate : But if this retreat be continued, they are again taken from their bed of suffering, and often, even in the first movements, they faint and expire ! If horrid war must not cease, surely it were for the honour of human nature, that some provisions were made, some mutual terms entered into betwixt contending nations, for the honourable treatment of the wounded. Army surgeons have long strived to invent some means of conveying their patients more safely, but all in vain : A rude square box was presented in the Academy of Surgery of France, invented by one of their greatest surgeons, La Faye ;—others were invented by Mr. Gooche, having circles and buckles,—and springs very ingenious, and surely, in some cases, very useful ; and this also (of conveying fractured limbs safely) is the chief use of Mr. Wathen's *SPLINTS*, which are perhaps the most simple and manageable, and most convenient of all these machines. Perhaps the construction of waggons, with hammocks slung in them, might be still more useful ; but move them as tenderly as we may, we shall still hear the same lamentations that Ranby makes, about " the cruelty of conveying wounded men away under all the miseries of lacerated limbs and bleeding arteries." To such sufferings, there cannot fail to succeed spasms and fevers, inflammations and

gangrenes, with all such disorders of the general system, or of the wounded limbs, as must render vain every attempt to save either the limb, or the life of the patient.

Thus you will foresee an argument of necessity as well as of choice, and that limbs, which in happier circumstances might have been preserved, must often, in a flying army, or in a dangerous camp, be cut off. It is less dreadful to be dragged along, with a neat amputated stump, than with a swollen and fractured limb, where the arteries are in continual danger, from the splintered bones, and where, by the least rude touch of a splinter against some great artery, the patient in a very moment loses his life.

When we cast an eye over this long catalogue of dangers, and consider the hardships and mischances of a soldier's life, we see plainly that in the case of gun-shot wounds, in camps and hospitals, many limbs must be amputated, which, in private practice, might have been saved. And we cannot but be surprised when we first hear army surgeons declaring, that they never amputate, however desperate the case. But when we look into the records of their practice, we find them driven into this extreme by absolute want of success, whenever they performed amputation. To what cause we are to trace this want of success, it is not easy to determine ; perhaps to operations ill performed,—perhaps to operations done at improper seasons,—a thousand accidents may affect this point, and we have the comfort of knowing, that this want of success is not universal ;—Mr. Belguer says, “ My chief motive for refusing to perform amputation was, that I had observed, that in the former years of the wars, *all* died who had their limbs cut off.” Why, surely if all died who had their limbs cut off in the former years of the war, Mr. Belguer could not have done otherwise than as he did, i. e. to leave all those, wounded with gun-shot wounds, to take their chance, to live or die \*.

\* “ Jam cum ex tot vulneratis, quibus per priores belli annos ob gravissima vulnera artus resecti sunt, vix unus, alter ne vix quidem, servatus sit ; sine errandi periculo poterimus conjectare, haud dubie maximam horum, quos neglecta membri amputatione sanitati reddidimus, vitam sanitatemque cum morte commutatu-

The French surgeons, during the war of 1746, declare, with one voice, that “ of those who had their limbs amputated, two thirds surely died.”

To this we have only to say, that if, in the Prussian camp, every man who had his limb amputated died, that is to be the rule of the Prussian surgeons. If in the French military hospitals, not less than two thirds died, then let that be the rule and vindication of the French surgeons ; but the rule of the Prussian surgeons was not to be the rule of the French surgeons, and the rule of the French surgeons is not a rule by which the British surgeons are bound to abide. And the amputations of the year 1745, are, I believe, very unlike those of 1795.

In that war, they did not even attempt to perform the amputation by double incision, but cut directly to the bone ; they never, even in the most favourable circumstances, could perform their cure under four, five, or six months. We find their patients dying of hæmorrhages, on the fifth or sixth days. We find them performing their amputation in the time of fever and irritation, or in the midst of camp diseases. Surely, then, it had been easy to foretel what would be the issue of practices like these \*.

But proofs of these misdoings are required ; and I will not leave you under that slight impression that my bare assertions may make : The operations, upon which the French surgeons have reasoned, were those which were performed after the battle of Fontenoy ; and my remarks are, 1st, That these amputations were not performed absolutely upon the spot, as in a besieged city, in trenches, or in a ship of war. The soldiers were hurried away to the hospitals of Doway and Lisle, and there these unfortunate operations were performed. 2dly, That they were per-

res fuisse, si vulnus, quod Chirurgus, artum præcindens, facit, ad vulnus, in acie acceptum, accessisset.” Dr. Ferriar observes, “ that truth distils but very slow through Teutonic Latin.”

\* Mr. Lucas says, of not less than sixty or seventy amputations done in our hospital, not more than four or five have died ; and this is indeed the superiority which the neat amputations, and the speedy adhesion procured by Mr. Lucas, Mr. Allanson, and their friends, in that part of the country, must give them.



formed after the pain, fever, or convulsions had come on ; for Mr. Faure says, “ the earlier you amputate, the sooner you condemn your patient to die ; for death must be the consequence of performing operations in a system disordered and troubled, and in a febrile state, from the accidents of the wound.” This he says in allusion to the amputations performed after this particular battle. Nay, this of amputating in circumstances like these, was not done merely through necessity ; it was common doctrine and practice with the French surgeons. Boerdenave says, “ If convulsions, spasms, and other symptoms come on, and if incisions, dilatations, and the extraction of foreign bodies do not appease them, unquestionably we must amputate \*.” “ Or if in consequence of the acute continual pains, there come on convulsions of the part, which even the cutting of the tendons across does not appease, then we must perform amputation †.” If the French surgeons were busied in the midst of fevers and other bad symptoms, and what is worse, dilatations and extractions of foreign bodies, in performing operations which should be thought of only when all these disorders are quieted, we see, in that piece of misconduct, one cause of their ill success.

3dly, That they performed their amputations but poorly, is plain from what Mr. Boucher entitles, “ A list of our successes by amputation, in our hospital of St. Saviour ;” in his list of nine patients, one had his arm amputated on the fourth day ; surely this was not the most favourable moment ; another had amputation performed six days after the battle ; another on the fourth day, the ball remaining in the knee joint, and he died ; one died the fourth day after amputation, which looks as if there had been something wrong in the operation itself ; a captain of the regiment of Dillon died of the bleedings the eleventh day after the amputation ; and yet of these nine subjects they saved four. Even by their list of successes, it appears that some had died of hæmorrhagy, and of course, that the operations were ill performed ; and in this same list, Mr. Boucher records the dates of two cures only,

\* P. 234. N. B. Mr. Faure repeats this at page 237.

† Mr. Boucher, p. 312.



the one is of an amputated arm, cured in five months, the other of an amputated leg, cured in six months. We are told, moreover, that at this battle of Fontenoy, there were few surgeons; so that many lost their lives by the amputations not being performed till they came to the hospitals, when it was too late: it is very likely also, that where the surgeons were so few in number, they could not be very good.

Then, surely, in this affair of the expediency of amputation, we must, in order to do justice to the question, contrast the operations of 1745 with those of 1795. Those were ill performed;—some died on the fourth day; some died of hæmorrhagy; some died languishing under the gleety discharges of conical and ill-conditioned stumps; and none of them were cured under five or six months of suffering and danger: Whereas, our stumps, instead of being open for five or six months, are more frequently healed by adhesion in five or six days; and this quick adhesion, though it be not perfect, will almost always be such as to prevent the bleedings or gleetings sores, the diarrhœas and fevers which, in a military hospital, are so much to be feared; and also, to lessen the danger of any sudden movements which the sickly part of an army may be forced to make. The adhesion is almost completed with us before that term in which they lifted their first dressing, in fear and trembling, and with a tourniquet round the limb, lest the arteries should burst out\*.

In short, every step of our inquiry proves most clearly to us, that surgeons have been driven into this line of conduct by the ill success of their amputations, till at last it degenerated from a question, Whether, in certain circumstances, we should amputate a limb? into a question, Whether amputation could be so performed, as to save many lives? Belguer was driven into this line of conduct by the ill success of amputation in the former years of the war, and we still find the French surgeons harping upon the

\* No doubt, a great abatement of any success we may promise ourselves, must be made for the bad air of such an hospital, which will not allow adhesion to take place, neither so regularly, nor so easily, as in a healthy hospital, or in private practice.

old string. But it is very plain, that the successes of the Prussian surgeons are not to be received as rules for the French surgeons, nor the ill success of the French to stand as precedents for the British surgeons ;—nor are the operations of the year 1745 to be put in competition with those of the year 1795 : The army hospitals give no rule for a county infirmary, nor a great hospital for a small one ;—nor is private practice to be guided by hospital practice. We must, in the general question, make our calculations upon a greater scale, risking sometimes more, sometimes less, the degree being left to the discretion of the surgeon ;—and if the foregoing reasoning can be of any service to the young surgeon, it can be only by hinting at a few of the very complicated principles which are to regulate his conduct.

“ Thus we perceive how strangely a man’s opinions grow up in his mind, distorted by a thousand circumstances.” Belguer forbade amputation, while Schmucker, who succeeded him in the care of the Prussian hospitals and camps, cuts off the leg where the tarsus only is shot, and in almost all the dangerous wounds of the lower extremities. Pott advises amputation, because he had practised chiefly in a crowded ill-aired hospital, where it was dangerous to attempt the saving of limbs, while it was but too easy a matter to cut them off. Kirkland, on the other hand, is against amputation, because he practised chiefly among hale and strong country fellows, who, after their accidents, continued to live in the country, with a wholesome diet and pure air. In reminding you of these various and fluctuating opinions, I do not impeach the conduct of these excellent surgeons ; I only warn you that these authorities are but the opinions of men, of mere men ;—that the example or precepts of the greatest surgeons, though they may direct and assist your judgment, can never give you an express rule ;—that it is upon your own judgment chiefly that you are to rely :—That it is, indeed, your duty to study the general argument with all possible care ; but that the variety of circumstances is such as to make each individual accident a peculiar case,—a variety for which there is no express nor absolute rule.

When I say to you, that you are to trust chiefly to your own

judgment, I would have you keep in mind these chief points, that you cannot save all those whose wounds and fractures you pronounce to be simple, and attended with little danger ;—nor will all those patients inevitably die, whose limbs are so bruised, that you advise them to be cut off :—And you must consider, above all, how much your patient's life depends on the decision of the moment, and how melancholy the consequence is, of your allowing that happy moment to elapse, which is never to be redeemed.

I was called, one evening, to a man of forty years of age, in moderate health, who had a simple fracture of the tibia only. The smaller bone was unhurt,—there was no distortion nor any great inequality,—the end of the broken bone was not particularly felt,—the skin was untouched ;—and being called on the very instant of the accident, I had him safely and easily conveyed to bed.

He then proceeded to tell me the cause of his accident ; but with such rapidity of utterance, that I doubted not that he was much intoxicated. He was so restless and unmanageable, that I was obliged to make one of the young gentlemen sit down in bed, above his sound leg, and hold the broken one steady with both his hands. I was obliged, upon the whole, to be rough both in my manner and in my operations, till I had got good stiff splints, and a steady bandage firmly applied. But when all this was done, and I had laid my patient down in bed (for till now he had sat upright, talked incessantly and vehemently,) although I had given him a very large opiate, and a glass of warm wine, he trembled and shook so violently, as to make the bed shake under him, with shocks and sudden convulsive twitches, which were truly alarming ; his shaking was at first like the cold fit of an ague, or like that convulsive trembling which often seizes women in childbed, which is at once so alarming and so harmless : but his shaking continued and increased all the evening, with a confusion of mind, and wildness of countenance, which was really frightful ; and with sudden startings which shook even the room, and would have disordered the leg very much, if I had not secured it, by tying it down betwixt two great pillows.

Being now at leisure to make deliberate inquiries, I was assured, that he was not drunk,—had never been addicted to drinking,—had never been troubled with any nervous disease.—I called twice during the evening, and found him every moment more and more strongly disordered. Every new report, concerning his former habits, and the certainty of his being a sober and healthy man, convinced me, that this was no ordinary case. I desired, that Dr. Monro might be called in.—Very large doses of musk, opium, and camphire, were given for three days.—During all that time, night and day, he continued incessantly shaking, so as to move the bed under him ;—he never slept,—he was always wild, sometimes highly delirious, sometimes struggling violently to get out of bed, and sometimes slightly convulsed. He laboured in this miserable condition for three days, fell somewhat lower in the fourth day, and then died.

Upon dissecting his limb, I found the skin and muscles entire,—the tibia only broken, and that fairly across ;—there was no remarkable splinter of bone, and, as far as I could discover, no lacerated nor wounded nerve,—there was but little thickening, as yet, of the surrounding membranes,—little effusion, and that not yet gelatinous, but serous merely,—no inflammation ;—and, notwithstanding all the violence of his disorder, there was not even the slightest swelling of the skin ;—every thing entitled me to set this down, as one singular instance of the uncertainty of general conclusions, and how little we are entitled to say, that any case, even the most simple, is absolutely safe.

On the other hand, we know, from frequent experience, what strange recoveries Nature and time will bring to pass, where the most judicious surgeons have declared the case absolutely desperate, and advised amputation. I may fairly give Mr. Lucas as an example, of a judicious surgeon condemning a limb ; and how well he reasoned, in so doing, in the following case, the sequel will explain ; and as for this case itself, it is one of the most singular in all respects,—it proves, in the most unequivocal manner, that although the constitution should be so strong, and so well managed, as even to bring the patient safely through all the dan-

gers of a nine months cure ; yet the limb, so preserved, will be rather a burden than a help to the patient, who will, sometimes, even after the cure has been accomplished, be obliged to have it cut off.

“ Esther Parsons, aged 75 years, was admitted into the infirmary, as Mr. Lucas’s patient, with a compound fracture of each leg, from a coal-waggon passing over them. One of her limbs was taken off above the knee immediately, according to Mr. Allanson’s method. In the other leg, four inches of the tibia were removed, and due pains taken to make the woman as comfortable as her deplorable situation would allow.

“ After a confinement in bed for upwards of ten months, various attempts were made to support her upon crutches : but after trying, for a few weeks, she endured so much pain, that she begged for the removal of a limb, that was to a degree burdensome, without a prospect of any amendment \*.”

This old woman had lain in bed, and been supported, no doubt, with some difficulty, through all the pains and dangers of a nine month’s cure.—She was now well ;—she had been trying, for some weeks, to walk with crutches ;—she was a woman too, whose work being all of a sedentary kind, she would have felt less the awkwardness or inconvenience of a deformed leg ; but yet such was her sense of her own situation, that she begged to have this remaining leg cut off ;—she had suffered amputation already and knew but too well the pain she was to undergo, and this was no ordinary case, in which the patient was to lose a diseased limb ;—she was to lose now both her limbs, and to crawl upon the ground. This is the very purest case of all ; it was determined not by the rules of surgery, nor by the prejudices of the surgeon ; it was determined by the patient’s feelings and consciousness of her own condition. It proves, that her surgeons judged wisely, in cutting off that leg, which they did cut off ; and that they had better, also, have cut off that which they had tried to save. It proves, that when there is a question about amputating, in a very bad compound fracture, the question is, Whether the



patient will consent to lose the leg at once, or risk the dangers of immediate gangrene and death? and, after escaping these first dangers, still encounter the pains and distresses of a tedious cure. And it almost proves, that wherever judicious surgeons put the question among themselves, of cutting off or of saving a leg, that leg is so shattered, that it is hardly worth the saving; of which we have also another striking example in the next page, where Mr. Lucas says, “James Walker, upwards of sixty years of age, was admitted into the infirmary with a very bad compound fracture, which prevented him from having his bed made for nearly nine months. At first every attempt was made to unite the wound by the first intention; but a suppuration soon prevented such an effect. He was repeatedly in imminent danger, and often expressed a wish to have his leg taken off. He did in *time recover*; but, for some years, his limb has continued of *little use to him*. \* We know too well, how much misery is caused by a leg which is of little use; and we may understand by this, that those surgeons, who boast of cures of this kind (a folly which Mr. Lucas is far from being guilty of), have more pride in relating the case, and telling what difficulties they have encountered, than they could have in showing the limb which they boast of having saved, or explaining how well the poor man was able to earn his bread with it.

It recalls many scenes of distress, which every surgeon must remember to have seen, of fine, healthy young men belonging to wharfs, warehouses, mines or coal-pits, having their limbs so shattered, that the surgeon has pronounced them dangerous in the extreme degree; and that if the patient lived in trying to save such

\* These two cases settle entirely that question, which Mr. Belguer proposes so confidently in the following terms: “*Quotus enim quisque est, qui non penitissime commoveatur animo, si de membrorum amputatione mentio injecta fuerit, si homines, mutilis manibus, truncatis brachiis obambulantes, aut altero pede abscisso claudos, ac pedem ligneum trahentes, grahissime innitentes, magis quam ingredienti, viderit, quique non tolerabilius malum putet, membrum aliquod debilitatum varieque distortum atque defiguratum, neque ad pristinos usus proxsus aptum habere, quam eo prorsus carere.*”

a limb, he must make a hair-breadth escape ;—and, among those so hurt, the surgeon will remember some dying of immediate gangrene,—some lost during the secondary fever,—some wasted by the profuse discharges and gleety sores ;—and a few submitting, not without danger, to have their limbs cut off, even in the midst of this suffering. The surgeon will recollect, with pleasure, a very few who have laboured through their nine months cure, and yet, even among those few, he will also remember some who have undergone all this long suffering and confinement, to save a limb, which was more a burden than a help to them, such as the surgeon was ashamed of, and such as the patient would fain have had cut off, but that he had not, like the old woman just mentioned, the courage to desire an operation. It puts us in mind of that sentence of Mr. Kirkland, which is one of the many instances of his sterling good sense in matters of practice :—“ That the injury, which requires amputation, is of that violent nature that it cannot be mistaken, the destruction of the parts, and the impossibility of their being saved, is manifest at first sight \*.”—This expression must, no doubt, be qualified a little, for the very best surgeons have been deceived, and no man of good sense or honour will refuse his opinion, for fear of being mistaken, for fear of shame ; we know too well the uncertainty of all reasoning on what nature will do or suffer, and how weak our own judgment is. We must expect to see many live, whose limbs have been condemned, and some die whom we thought we could save. We must risk some limbs which might have been preserved, to save a few lives. When the question comes to this, it is not whether the surgeon is right or wrong, but whether the poor man shall live or die. And then, if a judicious surgeon, upon deliberate consideration of the whole case, shall think either that life is in danger, or that the limb cannot be preserved, or that the one stands in competition with the other, he may deliver his opinion honestly ; no shame can follow, whatever the event may be.

In this great question, there is not one moment to lose. You

hold your consultation in the evening ; it is then that you decide the patient's fate ; and by the morning matters are so changed, that whatever your opinion was, by that opinion you must abide.

“ A patient was brought into St. Bartholomew's hospital, having a compound fracture of both the bones of the leg, within four inches of the ankle joint, and the muscles also were much torn. Mr. Crane, who was soon after sent for, took no small pains to persuade the man to lose his limb, as the only chance of preserving his life ; but being unable to prevail with him, Mr. Crane removed nearly two inches of the tibia, placed the limb in an extended state, and gave such directions as he thought necessary.

“ The next morning, the patient having suffered more than he could possibly have done from an operation, was now desirous of submitting himself ; but Mr. Crane was of opinion that such a step could only tend to hasten his death, which happened upon the third day after the accident.”

Thus, in all such cases does the patient's fate hang upon the decision of a moment ; and whenever the limb is so shattered, by a cannon ball, by the bursting of a bomb, by a waggon wheel passing over it, by the falling of any great weight ; whenever a limb is so crushed that there are many chances against its being preserved, and that the attempt must immediately endanger the patient's life, and that the limb itself when saved, will most likely be short and distorted, so as to be rather an encumbrance than a help to him, in such case it ought to be cut off. But where a lacerated and bleeding artery is added to these dangers, the question is more easily determined ; this either weakens the patient by the open bleeding, or disorders the limb still more by the inward driving of the blood : it is not perhaps impossible to save the patient, but yet the chances are so many against him, that it would be much better the limb were cut off at once.

“ A coal miner was admitted into the Leeds infirmary with his leg terribly shattered, by a fall of coals, several pieces of which had penetrated into the broken flesh, and was mixed with the muscles. At first the bleeding was violent, but it gradually abated ; cooling remedies were applied, and a tourniquet was kept in readi-

ness. The hæmorrhagy always ceased before any artery from which it came could be discovered. Although every attention was paid by a person placed to watch the limb, the patient died in ten days. Neither the habit nor state of the limb were such as to render amputation advisable, unless it had been done early."

Once more I must observe, that if these reasonings are useful to the young surgeon, it must be only by my having hinted at a few of those very complicated principles which are to direct his judgment,—no sensible man has ever ventured to determine, nor will dare to determine this as a general point ;—there is no possibility of defining beforehand, any future case ; there is no possibility of conceiving and marking the various degrees of injury, and the various combinations of contingent circumstances ; for, the constitution of the patient, his accustomed way of life, his former diseases, or his present health, his state of mind, his alarm or his coolness, the absence or the presence of fever, the conveniences or hardships of his situation ; even the manner of his fall, along with the degree and form of the injury ; in short, a thousand undescribable circumstances must affect the surgeon's judgment ; so that there can be no specific case described, no absolute rule delivered ; each accident is an individual case ; and the conduct of it, together with the safety of the patient, is to rest entirely on the discretion and abilities of the surgeon.

But as general rules, which still are not beyond the reach of frequent exceptions, perhaps the following aphorisms may be received.

1st, The chief cases requiring amputation are those in which the limb is crushed by a great ball, where the muscles are reduced to a mere pulp, the bones broken, the limb already nearly in a state of gangrene,—or where a bomb or great bullet has broken the bones and hurt the joint, although it should not have torn the skin, either from its being an oblique ball, or from its being almost spent.

2dly, A limb having the great bones broken by a musket ball piercing the limb may be saved ; a limb in which the secondary branches of the arteries, or even the great trunk is wounded (if

the bones be unhurt), may, as in the case of any more simple aneurism, be saved. It is only the complication of aneurism, broken bones, and wounded joint, that makes the case absolutely dangerous : and since no complication of circumstances can admit of a general rule, this must be left to the discretion of the surgeon, who must prepare himself by a review of all kinds and degrees of dangers, to reason upon the circumstances of each case.

3dly, It is but too plain, that there is a case of necessity, and a case of election, that often in a flying army, or in a dangerous camp, we must be under the distressing alternative of cutting off limbs, which, in happier circumstances, might have been saved, or of seeing our patient die a miserable and violent death. It is easier to be carried in waggons with a well amputated stump, than with swelled and broken limbs coated with their own blood, and new arteries torn by the fractured bones at every step ; and, therefore, if your patient, having a terribly fractured limb, cannot lie in quiet ; if you have reason to fear, that before he can arrive at any hospital, the limb will have fallen into gangrene, or the man himself be delirious or convulsed ; if he have wounded arteries, which the surgeons cannot secure, and that he cannot have skilful nurses, or young surgeons to watch the bleedings, you must cut off the limb. But here also much is left to the discretion of the surgeon. Nothing seems more harsh or unfeeling, than to say that any circumstances can be an apology for a thing which should not be done ; but still it is plain, that the circumstances of an army, or a besieged city, make a part of the case of every individual soldier in that city or army, and that the necessity of the thing, according to the vulgar adage, is itself a law.

4thly, If the thigh bone be broken into many pieces, and with large splinters driven through the skin, if the knee joint be shattered and torn, if the tibia and fibula be terribly fractured, as by a ball, or a loaded carriage passing over it, and that along with that compound fracture, with crushed bones, detached splinters, and the skin and muscles macerated in a proportioned degree, there also be lacerations of the tibial and fibular arteries, the limb cannot be saved. And although the foot may be saved when a ball



has passed through the heel bone, or has passed quite through the tarsus (although it have splintered all the bones), yet when the ball sticks in the tarsus, it is a very dangerous wound (often followed by locked jaw or gangrene), in which it is difficult to save the foot ; but when both the ankle joint is laid open, and the tarsus also is much lacerated and disordered, it is almost impossible to save the foot, it had better be cut off\*.

5thly, In this fourth rule I have mentioned chiefly the dangerous wounds of the lower extremity ; and the reason of my doing this falls now to be explained ; for it is really in wounds of the lower extremity chiefly, that we are reduced to the hard necessity of cutting off the limb. The lower extremity is larger, forming a great proportion of the whole body, whence a high fever and greater pain ensue ; and in its wounds there are larger arteries to bleed, greater bones to be reunited or restored, and larger masses of muscle and skin, to fall into inflammation ; but the chief danger is the confinement in wounds of the lower extremities, with consequent loss of health. The uniform posture exhausts the spirits, and the profuse discharges exhaust the strength ; and few have the resolution to go through all the hardships of a nine months cure. Whereas, in wounds of the upper extremities, the proportion of the wound to the whole system is small, the fever slight ; the case is in all respects more manageable ; a man wounded in the arm can be carried with little comparative suffering from a field of battle, and he is not confined for months to a loathsome hospital ; the moment that his fever is gone, he is able to rise, he recovers his health, and he preserves it during the whole cure.

\* That none of these wounds can be cured, it is far from my intention to affirm ; I know well that they have been cured ; I have seen such desperate cases cured. We have, among other cases, one of a knee joint, another of a thigh bone terribly shattered, and yet cured by the celebrated Deffault ; but the question is, Whether the dangers be not greater than the chances ? and I think the proper thing to be said on this occasion is just this : “ When a judicious man says that a limb ought to be removed, he does not mean that it is impossible, at all events, that such limb can be saved, nor that the patient must infallibly die.” Pott, p. 100.

We struggle long and patiently to preserve the hand, for it is by his hands that the poor man earns his bread ; but, in a great wound of the leg, we ought not, by a long confinement, to risk his life to society, or to those who are depending upon him ; and, when he is forced to lose his leg, he, still having his hands to work with, continues a useful citizen, though, no doubt, he will be useless as a soldier ; and this very distinction constitutes, I believe, the chief difference betwixt the practice of the English and of the Prussian surgeons, whose decision on this point has been, if I am not greatly mistaken, settled by some higher authority than that of a jury of army-surgeons.

6thly, Amputation should, in those cases where the limb is plainly and irrecoverably disordered, be performed upon the spot.

When the operation has been delayed, either by the inconveniencies of your situation, the tardiness of consultants, or by the real accidents and difficulties of the case ; in short, wherever the pain or swelling, fever, or convulsion, have come on, there you must refrain from present operation, and must try to save the limb. But again, after the patient, having escaped the first dangers of gangrene, has lain for six weeks, or two months, under profuse suppurations or exfoliating bones ; if, while you are trying to support him with bark and wine, with very poor hopes of accomplishing a cure, he should plainly be sinking under the hectic fever, then again amputation may be proposed ; but it is, on one hand, very distressing to throw away all hope, and lose the advantages which our patient has struggled for, through so much suffering and danger ;—while, on the other hand, his life, which was at first in danger from pain and gangrene, is now a second time in danger from colliquative suppurations and a hectic, which wastes his strength ;—but this very weakness, which has brought him into this condition, is so far favourable to the success of the operation, that it may be fairly questioned, whether this second period be not fitter for amputation than the first.

7thly, With regard to the operation itself, I may venture to affirm, that the ill success of the French and Prussian surgeons

proceeded from operations either done under inauspicious circumstances, or in themselves ill performed ; and that, by a prudent choice in point of time, and neatness, in the manner of performing the operation,—a particular care in securing the arteries, and every endeavour to keep your patient clean and warm in an easy condition, and in general health, you will be successful, not indeed in the proportions of private practice, but in proportion to your means and opportunities ; and more than this, no man of good sense can look for.

8thly, To conclude ; you must never amputate during fever, pain, convulsion, great swelling of the limbs, but most especially, during that high-coloured inflammation which betokens approaching gangrene ; there the disease is in the constitution ; by cutting off the limb, you do not cut off the disease :—The gangrene, in two days, shows itself upon the stump, or the convulsions, which cease, perhaps, for a moment, return along with those startings which follow amputation ; and then follow a bending back of the body, locked jaw, and a very cruel death. This is the reason of our performing amputation, either on the instant, viz. before these terrible symptoms have begun, or later, and after they have ceased ; this is the foundation of Le Dran's axiom, “ That where there is plainly a necessity for losing a limb, the sooner it is done the better.”—And my intention in this reasoning, and these remarks, is to establish this rule in your minds above all the seduction of wonderful cases, which, though surely true, are yet mere exceptions, which it were better for you not to know, than trust to too much \*.

Here I feel it natural to express my dislike, once more, of this unphilosophical way of setting up particular exceptions, which our collections abound with, against general rules, of which our systems are very destitute.

\* I have mentioned my intention of giving a proper review of Belguer's opinions, of which some of these strictures may perhaps be thought in some degree a refutation ; but yet I am sensible that such an undertaking would be tedious to some, and to many, I hope, quite superfluous.

The true appearance of these cases is really amusing to a deliberate observer; and the conclusion, which should be drawn from them, is very obvious. We could, I think, upon an emergency, produce ten or twelve tales of knives cut out from the stomach safely,—as many cases of gangrenous hernia cured,—a hundred wounds of the brain, with great spoonfuls of it, discharged, the person continuing very sensible and witty, and sometimes, as it has been remarked, wittier than before; and most easily could we produce a hundred good cures by the Cæsean operation, the woman being no more hurt than if she had been bled in the arm for a headach. And yet, notwithstanding all this, no man will believe, that knives are easy in the stomach, strangulated hernia safe, or wounds of the brain without danger; neither should Mr. Belguer's twelve cases, nor any twelve cases produced by any other man, induce a surgeon to believe, that gun-shot wounds, with lacerated arteries and broken bones, are safe, especially if that surgeon have seen (as indeed we see daily) a patient dying of gangrene, from a luxated ancle, in the very moment in which his surgeons were consulting about cutting off his leg.

Such strong repeated protestations, upon this single point, cannot be superfluous, when we see a whole army of surgeons, deputing, as it were, their head surgeon to say, In all the Prussian camps and hospitals during a whole war, among six thousand wounded men we have not cut off one single limb!—indeed, the impression which such an assertion must make, and the high credit of Belguer's book in this country, leads me, unpleasant as it may be, to the task of explaining his book to you, which shall be the subject of my next discourse.







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